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THE NEW INTERNATIONAL ENCYCLOPÆDIA

SECOND EDITION

VOLUME XIV

NEW YORK
DODD, MEAD AND COMPANY
1925

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The University Press, Cambridge, U.S.A.
Boston Bookbinding Co., Cambridge, U.S.A.

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the Key to Pronunciation in Vol. I.

ā	as in ale, fate.
ā̇	" " senate, chaotic.
â	" " glare, care, and as *e* in there.
ă	" " am, at.
ä	" " arm, father.
ȧ	" " ant, and final *a* in America, armada, etc.
a	" " final, regal, pleasant.
a̤	" " all, fall.
ē	" " eve.
ē̇	" " elate, evade.
ĕ	" " end, pet.
ẽ	" " fern, her, and as *i* in sir, etc.
e	" " agency, judgment.
ī	" " ice, quiet.
ī̇	" " quiescent.
ĭ	" " ill, fit.
ō	" " old, sober.
ō̇	" " obey, sobriety.
ô	" " orb, nor.
ŏ	" " odd, forest, not.
o	" " atom, carol.
oi	" " oil, boil.
o͞o	" " food, fool, and as *u* in rude, rule.
ou	" " house, mouse.
ū	" " use, mule.
ū̇	" " unite.
ŭ	" " cut, but.
ụ	" " full, put, or as *oo* in foot, book
û	" " urn, burn.
y	" " yet, yield.
B	" " Spanish Habana, Córdoba, where it is like English *v* but made with the lips alone.

ch	as in chair, cheese.
D	" " Spanish Almodovar, pulgada, where it is nearly like *th* in English then.
g	" " go, get.
G	" " German Landtag = *ch* in Ger. ach, etc.
H	" *j* in Spanish Jijona, *g* in Spanish gila; like English *h* in hue, but stronger.
hw	" *wh* in which.
K	" *ch* in German ich, Albrecht = *g* in German Arensberg, Mecklenburg, etc.
n̠	" in sinker, longer.
ng	" " sing, long.
N	" " French bon, Bourbon, and *m* in the French Étampes; here it indicates nasalizing of the preceding vowel.
sh	" " shine, shut.
th	" " thrust, thin.
TH	" " then, this.
zh	" *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used as in tā'b'l (table), kăz''m (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as G, H, K, N, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on Pronunciation.

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THE NEW
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LEP′ROSY (OF. *leprosie*, from ML. *leprosia*, from MGk. *λέπρωσις*, *leprōsis*, leprosy, from Gk. *λεπροῦσθαι*, *leprousthai*, to become leprous, from λέπρα, *lepra*, leprosy). A constitutional disease of chronic character, endemic in certain localities, contagious through intercourse with an infected person, and due to the presence of the *Bacillus lepræ* (Hansen); being characterized by the formation of nodular infiltrations and other nutritional changes in the skin and by an eruption. It is also called *Lepra*, *Elephantiasis Græcorum*, *Satyriasis*, *Leontiasis*, as well as *Zaraath*, or *Tsaraath*, in Hebrew, and *Uchetie* in Egyptian. It is known in China as *Fa-Fung*, in India as *Kushta*, in Arabia as *Juzam Dolfil*, and in Norway as *Spedalskhed*. Egypt is called the cradle of leprosy, and it certainly existed in that country from a very remote period. On papyri found in the tombs of kings descriptions of it are given. The Papyrus Ebers, transcribed in the fifteenth century B.C., describes and prescribes for it. Assyrian and Babylonian hieroglyphics relate to the disease. It has existed in India at least 3000 years. Leprosy was described by a writer of 2000 years ago in China. Greece had seen the disease before Hippocrates wrote of it. It was probably taken to Arabia before the time of Mohammed. It was common among the Jews in 260 B.C. Aretæus (81 A.D.) found it spreading over western Europe. The Romans contracted it from the Greeks; the troops of Pompey carried it into Italy in the first century B.C. Pilgrims from the Holy Land introduced the disease into England (Simpson). The returning Crusaders in the tenth, eleventh, and twelfth centuries spread the disease thoroughly. Wales, Ireland, Norway, Sweden, and other parts of Europe became infected. The invasion of America by the disease cannot be traced.

Segregation of lepers was practiced at a very early date. According to Herodotus, the Persians exiled lepers in his day. Moses, following Egyptian customs, segregated lepers among the Jews. Canthie is authority for the statement that the Chinese burned lepers alive. In the Middle Ages leprosaria were established in France under chaplains, and the lepers were uniformly garbed and provided with a rattle, with which to warn others of their approach. In the time of Louis VIII there were 2000 leper houses in France, while the number in Europe, excluding those in Russia and Sweden, was 19,000 (Morrow). In the British Isles isolation was enforced, lodgings in leper houses, cowls, gray habits, sticks, and clappers being furnished to the unfortunates. In modern times strict segregation is practiced in almost all localities where lepers are found. In the United States Louisiana, California, and Massachusetts have established special hospitals for lepers. In various other States isolation pavilions or other means of segregation are provided as necessity arises. It is estimated that there are in the world nearly 3,000,000 lepers, China furnishing 2,000,000 of these and India furnishing 200,000. Japan has 20,000 known lepers, and Africa, Arabia, Persia, Russia, Norway, Sweden, Italy, Greece, and Spain have most of the remainder. There are many cases in Central and South America, Mexico, and the West Indies, and a few in Canada.

The annexation of the Hawaiian Islands (q.v.) by the United States carried with it the problem of caring for the lepers. In 1898 Dr. D. A. Carmichael, of the United States Marine Hospital Service, made an extended report on leprosy in the Hawaiian Islands. There were then in the leper settlement on Molokai 1073 lepers; also 61 nonleprous children of leprous parents; also 73 helpers (Kokuas), nonleprous persons living in the settlement and caring for relatives; also nonleprous priests, sisters, brothers, teachers, etc., 61. Grand total, 1207. The new cases in 1900 were but 85 in number, as compared with 132 in 1890. At the close of 1901 the number had fallen to 909, and as a result of rigorous regulation the number has tended to constantly decrease. According to a survey made by the United States Public Health Service, there were, in 1911, 278 lepers in the United States proper, only 72 of which were isolated and cared for by the local authorities. There were in addition 28 known lepers in Porto Rico, the leper colony of which is on Cabras Island. In the Philippine Islands the disease constitutes an important health problem. About 6000 lepers had been transferred to the Culion leper colony; Cebu, an island with one-tenth of the Philippine population, furnishing one-half of the cases.

Leprosy spreads by contagion. It is believed that the organism obtains entrance through the nasopharynx and is spread by the nasal secretions. In practically all cases ulcerations in this situation are found. For many years, owing to the vigorous advocacy of the theory by Jonathan Hutchinson, a fish diet was believed to be responsible for leprosy. Hutchinson based his contention chiefly on conditions in India. Other observers, however, point out the fact that the disease is widespread among those castes whose religious beliefs forbid the eating of fish. Goodhue, in the Hawaiian Islands, found the *Bacillus lepræ* in mosquitoes and bedbugs. The bacillus of leprosy was discovered by Hansen (q.v.), of Bergen, Norway, in 1871. Neisser, in 1879, after extended researches, confirmed Hansen's claims. The bacillus is a straight or slightly curved thin rod, nonmotile, occurring singly or in pairs attached end to end, but not in chains. When stained, it appears like the bacillus of tuberculosis, but often takes stain in such a way as to suggest that the protoplasm is fragmented, the bacilli then appearing like cocci in short rows, darkly stained points alternating with unstained points. The bacilli appear in very large numbers in the leprous tissue, especially in the tubercular form, lying in bundles of several bacilli arranged parallel to each other, the bundles lying in various directions. Under the influence of the bacillus nodules of new tissue are formed in the skin or subcutaneous tissue. These nodules resemble granulation tissue, being made up of a fibrous stroma, in which are cells of various shapes. Bacilli are present in the tissue in large numbers, both in and between the cells. The nodules are most common in the exposed parts of the skin, face, hands, etc., but may occur in any part of the skin. The mucous membrane of the eyes, nose, and mouth may be affected. More rarely nodules develop in deeper parts of the body. The nodules may be large or small. There may be extensive ulceration with later cicatrization, sometimes producing in the face the so-called "facies leontina." Deep ulcers affecting the fingers or toes may result in extensive loss of substance—"lepra mutilans." In the form known as anæsthetic leprosy the lesion seems to be a peripheral neuritis, due to the presence of the bacilli in the nerves.

Among the most notable symptoms of leprosy are fever of an irregular type, malaise, dyspepsia, nosebleed, vertigo, headache, neuralgia, pains in the arms and legs, and excessive action of the oil and sweat glands. Nearly all victims have a sense of depression and a feeling of impending calamity.

Some authorities mention three forms of leprosy: the *macular*, characterized by dark-red or black stains; the *anæsthetic*, characterized by loss of sensation in patches of the integument and flesh; and the *tubercular*, characterized by nodules of tubercular granulation tissue, or a diffuse infiltration in skin and mucous tissue. Some cases unite all three varieties. In the macular-anæsthetic type the chief changes are in the nerves, leading to destruction of nerve fibres with consequent anæsthesia, paralysis of muscles, and trophic disturbances. The period of incubation of leprosy is from three to seven or more years, patches first appearing on the unexposed parts of the body, with ulcers on the upper part of the nasal passages, thus rendering detection difficult. Heredity in leprosy is not considered a factor.

There is no specific treatment for this disease, but of an innumerable list of remedies which have been used since the time of Moses a few appear to give satisfactory results. One of the oldest is chaulmoogra oil. More cures have resulted from its use than from any other single remedy. In India it is extensively employed. In the Fiji Islands the patient is placed on a pyre of green leaves of a tree supposed to be specific against leprosy. The skin is slowly cooked and scorched, and if the victim survives the treatment he may recover. In the West Indies and some parts of South America it is believed that the bite of a venomous snake will cure, and acting on this theory Dyer used the antivenomous serum of Calmette with uniformly good effect. Of a number of specific serums which have been prepared, leprolin, introduced by Root, of the Indian Medical Service, has proved moderately successful. It is derived from a toxin of the *bacillus lepræ*. Where there are superficial ulcerations the X ray tends to promote healing. Consult: Sir Jonathan Hutchinson, *On Leprosy and Fish Eating* (London, 1906); Hawaii Board of Health, *The Molokai Settlement* (Hawaii, 1907); W. R. Brinckerhoff, "The Present Status of the Leper Problem in Hawaii," in *Public Health Bulletin, No. 184* (Washington, 1908); Rupert Blue, *The Public Health Aspects of Leprosy in the United States* (Chicago, 1913); McCoy and others, "Studies upon Leprosy," in *Public Health Bulletin, No. 61* (Washington, 1913). See HANSEN.

LEPSIUS, lĕp′sē-ụs, KARL RICHARD (1810–84). A German archæologist and Egyptologist, born at Naumburg, Dec. 23, 1810. He studied at Leipzig, Göttingen, Berlin, and Paris. His first work, *Die Paläographie als Mittel der Sprachforschung* (1834), received the Volney prize of the French Institute. For some years after this he wrote chiefly on paleography, on the Etruscan, Oscan, and Umbrian inscriptions (*Inscriptiones Umbricæ et Oscæ*, 1841), and on comparative philology (*Zwei sprachvergleichende Abhandlungen*, 1836, etc.). With his *Lettre à M. le professeur H. Rosellini sur l'alphabet hiéroglyphique* (1837), written while he was living at Rome (where he became intimately acquainted with Bunsen), he entered the field of hieroglyphic research. In 1842 he was placed at the head of an expedition sent to Egypt by the King of Prussia and spent three years (1842–45) in exploring the ruins of Egypt and Nubia as far as Khartum. The results of this expedition were given to the world in the magnificent work *Denkmäler aus Aegypten und Aethiopien* (1850–59), published at the expense of the King, and in his *Briefe aus Aegypten* (1852). In 1866 he again visited the place and discovered the Canopus Tablet, which, like the Rosetta stone, had its inscriptions in hieroglyphic, demotic, and Greek. He became professor of Egyptology at Berlin in 1846, director of the Berlin Egyptian Museum in 1865, and director of the Royal Library in 1873. Of his numerous works the following are the most important: *Chronologie der Aegypter* (1840); *Todtenbuch der Aegypter* (1842); *Das bilingue Decret von Kanopus* (1866). He also wrote on metrology, *Die Längenmasse der Alten* (1884), and on phonetics, *Standard Alphabet for Reducing Unwritten Languages, etc.* (1863). His *Nubische Grammatik* (1880) touched on comparative African philology. He died July 10, 1884. Consult Georg Ebers, *Richard Lepsius, ein Lebensbild* (Leipzig, 1885; Eng. trans., New York, 1887).

LEPTÆ′NA (Neo-Lat., from Gk. λεπτός, *leptos*, slender). A fossil brachiopod genus characteristic of the Middle Paleozoic rocks throughout the world. The shells are of deltoid outline, with concentric folds and fine radiating lines.

All the varieties, ranging from the Upper Ordovician into the Lower Carboniferous rocks, are probably only modifications of a single race typified by the species *Leptæna rhomboidalis*, which has undergone adaptive changes caused by the climatic and physical conditions during the various geological epochs in which it lived.

LEPTAN′DRA (Neo-Lat., from Gk. λεπτός, *leptos*, slender + ἀνήρ, *anēr*, male; in modern botanical terminology, stamen). A generic name proposed by Nuttall for *Veronica virginica*, Culver's root, or Culver's physic, and now employed as the pharmaceutical name of that plant. In America it grows in rich woods from Vermont and Manitoba southward and is often cultivated for ornament. It blossoms in July and August. See Speedwell, and Plate of Bloodroot, etc., accompanying article Sanguinaria.

LEPTOCARDII, lĕp′tȯ-kär′dĭ-ī (Neo-Lat. nom. pl., from Gk. λεπτός, *leptos*, slender + καρδία, *kardia*, heart). A class of small fishlike animals belonging to the phylum Chordata. It includes two genera, *Amphioxus* and *Asymmetron*. The leptocardians are commonly classed with the vertebrates, although they possess no true backbone, and as such they form the Acrania in distinction to all the remaining vertebrates—the Craniata. (See Classification of Animals.) Because of this primitive organization and consequent low position among chordates, they form a most important group for the naturalist, and their anatomy and development have been extensively studied. See Amphioxus.

LEPTODIS′CUS. See Noctiluca.

LEP′TOME (from Gk. λεπτός, *leptos*, slender). The conducting portion of the phloëm of a vascular bundle. It includes the sieve tubes, companion cells, and bast parenchyma, but not the bast fibres. See Hadrome, Mestome.

LEP′TOMEN′INGI′TIS. See Meningitis.

LEP′TOSPORAN′GIATES. A name applied to those vascular plants whose sporangia arise as external organs from a single superficial cell. The contrasting plants are eusporangiates, whose sporangia are developed beneath the epidermis, although of course they usually project above the surface. The leptosporangiate condition is exceptional, since it occurs only in the majority of modern ferns. Some of the ferns, all of the rest of the Pteridophytes, and all the seed plants are eusporangiate.

LE PUY, l*e* pwē. A town of France. See Puy, Le.

LE QUEUX, l*e* kū, William Tufnell (1864–). An English novelist, born in London. He was educated there and in Italy, was an art student, then a journalist in Paris, and on his return to London was editor of *Gossip* and *Piccadilly*, and from 1888 to 1893 parliamentary reporter and then subeditor on the *Globe*. He traveled much, in the East, in Africa, and in the Arctic, and became a member of the Council of the Republic of San Marino. His novels include: *Guilty Bonds* (1890); *Devil's Dice* (1896); *Of Royal Blood* (1899); *In White Raiment* (1900); *Her Majesty's Minister* (1901); *The Tickencote Treasure* (1902); *Secrets of the Foreign Office* (1903); *The Invasion* (1906); *The House of Whispers* (1909); *Hushed Up* (1910); *Fatal Fingers* (1912); *The Death-Doctor* (1912); *The Hand of Allah* (1914); *The War of the Nations* (1914); *Whoso Findeth a Wife* (1915).

LERAY, le-rå′, Francis Xavier (1825–87). An American Catholic prelate. He was born at Châteaugiron, France; was educated at Rennes; and, having come to the United States at 18 and studied theology in the Sulpitian College, Baltimore, was ordained a Roman Catholic priest in 1852. He taught in St. Mary's College, Maryland, and became its prefect. After missionary labors in the West, he worked at Jackson, Miss., during the epidemic of 1853, and at Vicksburg, Miss., in 1857–61. After the Civil War, in which he served as a Confederate chaplain, he returned to Vicksburg, rendered valuable service during the plague of 1867, and in 1873 was made Bishop of Natchitoches, La. He was appointed Archbishop of New Orleans in 1883, and died in France.

LERCHE, lĕr′k*e*, Vincent Stoltenberg (1837–92). A Norwegian genre and architectural painter, born at Tönsberg. He was a pupil of Gude at the Düsseldorf Academy. In 1863 he won a traveling prize that enabled him to visit Italy, where he devoted himself chiefly to architectural drawing. He afterward visited the Rhinelands and Scandinavia. His best works are interiors of churches or convents, later used as backgrounds for genre scenes of monastic life in the Middle Ages, portrayed with humor and charm. Among the best of these are "The Interior of St. Lambertus in Düsseldorf" (1862, Bergen Museum); "Cardinal" (1870, Christiania Museum); "The Cloister Library" (1872, Stockholm Museum); "Collection Day at the Dominican Monastery" (1873, Christiania Gallery). He was also a wood engraver, caricaturist, and author.

LERCHENFELD, Amand, Baron von Schweiger-. See Schweiger-Lerchenfeld, Amand, Baron von.

LERDO DE TEJADA, lår′dȯ då tå-hä′då, Miguel (1812–61). A Mexican statesman, born in Vera Cruz. In 1852 he was president of the city council of Mexico and in 1855 was appointed Secretary of the Treasury in the administration of President Comonfort. In order to diminish the importance of the clergy and public corporations, he framed, while in this office, the Ley Lerdo (1856), which removed from all civil and ecclesiastical corporations the right to hold lands beyond that necessary for their legitimate operation, and provided that all unoccupied church lands should be sold at an assessed valuation. This radical measure, aimed at the Conservative or reactionary party, caused his retirement in 1857. In 1859, after the accession of Juárez to the presidency, Lerdo again became Secretary of the Treasury. Continuing his attack on the reactionaries, he aided in carrying through a law for nationalizing the landed property of the church and placing the religious orders under government inspection and control. In 1860 he became a judge of the Supreme Court. His friends made an unsuccessful attempt to elect him to the presidency.

LERDO DE TEJADA, Sebastian (1825–89). President of Mexico. He was born at Jalapa in the Province of Vera Cruz, was educated in the Seminary of Puebla and afterward studied law in the city of Mexico. He was admitted to the bar in 1851, became a judge of the Supreme Court in 1855, and two years later was made Minister of Foreign Affairs. Elected to Congress in 1861, he was chosen president of that body. In 1863 he was the first Minister of Justice, and then Minister of Foreign Affairs, always allied with the Liberal party. He was one of the most prominent leaders in opposition to the French intervention in Mexico, served the Provisional Government of Juárez faithfully while he was a fugitive and exile, and preserved a consistent attitude of antagonism to the Emperor Maximilian, whose death may be charged justly to Lerdo de Tejada and Juárez. On the return of the Republican government to the capital in 1867, after the withdrawal of the French, Juárez was reëlected President, and Lerdo became Chief Justice of the Supreme Court with a seat in the cabinet, and on the death of Juárez, in 1872, he succeeded him as President by virtue of his office. In October of that year he was elected President for four years. His administration was marked by considerable progress in economic and constitutional development, and the country enjoyed a comparatively long period of peace. In 1875, however, the elements opposed to a strong central government made common cause with the clerical reactionists, and a revolution broke out in several Mexican states simultaneously. In the presidential election of 1876 Lerdo was a candidate for reëlection and was opposed by Gen. Porfirio Díaz; Lerdo was declared successful, but his opponents asserted that official influence had been brought to bear on the voters and that the election was fraudulent. Díaz at the head of an army marched against the capital, and on Nov. 20, 1876, President Lerdo escaped to Acapulco. He went to the United States early in 1877, and subsequently resided in New York, where he died.

LERICI, lā'rē-chē. A city in the Province of Genoa, Italy, 4 miles southwest of Sarzana, which is 65 miles by rail southeast of Genoa (Map: Italy, B 2). It has a small harbor on the Gulf of Spezia and an ancient castle. In the Middle Ages it was the principal city on the gulf. It has machine works, iron foundries, shipyards, and fisheries. Pop. (commune), 1901, 9026; 1911, 9290.

LÉRIDA, lā'rē-ᴅȧ. The capital of the Spanish province of the same name, situated on the river Segre, a tributary of the Ebro, about 80 miles west by north of Barcelona, and on the railroad between that city and Saragossa (Map: Spain, F 2). It is built partly on a plain and partly on an eminence on the top of which stands an ancient castle. The town, which is important from a military point of view, is surrounded by walls and a moat and commanded by the citadel. It is a gloomy labyrinth of narrow and crooked streets, but contains a number of interesting old buildings, the most prominent being an old cathedral built in the thirteenth century in a strange mixture of Byzantine, Gothic, and Moorish architecture and now used as barracks; the church of San Juan, an interesting Byzantine monument of the twelfth century; several old convents, and a palace of the kings of Aragon. The town has a bishop's palace, a new cathedral in Corinthian style, a normal school, a theological seminary, and several academies, literary and scientific societies. Lérida has manufactures of wool, cotton, silk, leather, and glass. Pop., 1887, 21,885; 1900, 21,352; 1910, 24,531. Lérida is the Celtiberian Ilerda, noted for its heroic resistance to the Romans. It became an episcopal see under the Visigoths, and a council was held there in 546.

LÉRINS, lā'räɴ', Îles de. A group of small islands in the Mediterranean, off the south coast of France, and less than 2 miles from the mainland, forming a part of the Department of Alpes-Maritimes. It consists of the two small islands of Sainte-Marguerite (four miles in circumference) and Saint-Honorat (two miles in circumference) and a number of islets. They were settled at a very early period and played a prominent part in the monastic life of France. Sainte-Marguerite has a fort, in which were imprisoned the Man in the Iron Mask and Marshal Bazaine. Saint-Honorat has the ruins of an old monastery believed to have been founded by Saint-Honorat in the fourth century, and now inhabited only by a few monks. Both islands suffered greatly from the attacks of pirates.

LÉRIS, lā'rēs', Claire Josèphe Hippolyte. The correct name of the French actress better known as Mademoiselle Clairon (q.v.).

LERMA, lâr'mȧ, Francisco de Sandoval y Rojas, Duke of (1552–1625). A Spanish statesman. He gained an ascendancy over Philip III when the latter was Prince of Asturias and after his accession to the throne in 1598 became his Prime Minister, with the title of Duke of Lerma. He practically ruled Spain until 1618. The peace with England in 1604 and the truce with the Low Countries in 1609 are patent examples of the failure of his foreign policy, while the brutal persecution and expulsion of the Moriscos in 1609 and 1610 was a blow from which Spain never recovered. His finance measures were equally futile—the debasing of the coinage (copper money doubled in value, e.g.) and high-sounding edicts against luxury and against the making of silver plate. But, despite all these failures, his influence over the King never waned until his own son, the Duke of Uceda, plotted against him. When he saw that his fall was almost certain, he tried to induce Pope Paul V to grant him a cardinal's hat and succeeded early in the very year in which he fell. The unpopular Minister was forced to restore a large part of the ill-won perquisites of his administration when Philip IV succeeded to the throne in 1621. For a full account of the years of his power, consult Modesto Lafuente, *Historia general de España*, vol. xv (Madrid, 1855), where there are also full references to contemporary authorities.

LERMINA, lâr'mē'nȧ', Jules (Hippolyte) (1839–). A French journalist and novelist, born in Paris. He worked on several papers and finally became editor in chief of *Le Soleil*. In the *Corsaire* he vigorously attacked the Empire; he was arrested in 1867 for his part in the disturbances at the cemetery of Montmartre and was imprisoned; on his release he founded the *Satan*, which was soon repressed, like the *Corsaire*. Afterward he was imprisoned for three months because of his republicanism and in 1870 proposed the impeachment of the Emperor and was sentenced to two years in prison, regaining his liberty on the downfall of the Empire. His historical works include: *Histoire anecdotique illustrée de la Révolution de 1848* (1868); *Histoire de cent ans* (1884); and the valuable *Dictionnaire universel illustré de la vie française contemporaine* (1884). He wrote three plays—*La lettre rouge*, *Turenne*, and *La criminelle;* and many novels, using the pseudonym William Cobb as well as his own name. Among these stories are: *Les mystères de New York* (1874); *Les mille et une femmes* (1879); *Le fils de Monte Cristo* and *Le trésor de Monte Cristo*, continuing Dumas (1885); *Alise* (1893); *Calvaire d'amour* (1912). He translated Shakespeare (1887–98). In a different field are *La science occulte* (1890) and *Magie pratique* (1910).

LERMOLIEV, lĕr-mō′lyĕf, IVAN. The pseudonym of the Italian art critic Giovanni Morelli (q.v.).

LERMONTOV, lyĕr′môn-tôf, MIKHAIL YURIEVITCH (1814–41). The greatest Russian poet after Pushkin. He was born at Moscow and was of Scottish ancestry (his name is believed to be the Russianized form of Learmont). He lost his parents at an early age and was reared by his grandmother, who spared neither money nor time in giving him a good private education. In 1828, after a few years' sojourn in the Caucasus, he entered the school for nobles attached to the Moscow University and in 1830 the university, from which he was expelled in 1832 for some trifling escapade. He then entered a military school at St. Petersburg and became an officer of the Imperial Guard Hussars in 1834, leading the life common to ordinary officers of that day. It was in this period and under such demoralizing influences that he dashed off his earliest poems—*The Peterhof Fête, The Lancer's Wife, Mongo,* and others. He first attracted general attention by a poem written in 1837, after Pushkin's death, "On the Death of a Poet," in which he openly reproached the courtiers for Pushkin's death. This so displeased Nicholas I that he sent him to serve in the Army of the Caucasus as an ensign. Pardoned in 1838, he returned to St. Petersburg, but in 1840, after a duel with Barante, son of the French Ambassador, he was again sent to the Caucasus. Here he was killed in a duel by a comrade, Major Martinov, who thought himself described in Grushnitsky, a character in Lermontov's *The Hero of our Time.*

A purely subjective poet, he was alone in society, little understood by his friends, who always feared him and sometimes hated him for his merciless ridicule and stinging satire. He was in this and other respects the Byron of Russia, and in striving after intellectual heights he breathed freely only when away from "loathsome society" in the high regions of the Caucasus, which produced an indelible impression on him in his childhood, and which he has immortalized in his poetry. Lermontov began one of his best longer poems, "The Demon," when barely 15 and continued rewriting it until his death; yet careful study reveals little difference in the power of its various drafts. His fame spread like wildfire after the ill-starred "On the Death of a Poet," and when, a short time later, he published his "Song of the Merchant Kalashnikov," he was already recognized as the greatest Russian poet. This ballad, a clear and poetic vision of Russia's past, is the finest specimen of its kind in Russian literature—an artistic production, faithfully preserving the spirit and form of the folk song. Besides various dramatic and epic works, he wrote a great number of lyric poems. *The Hero of our Time,* a prose novel consisting of five separate sketches, appeared with a preface in 1841, but installments of it were originally published in a periodical during 1839–40. Besides being noteworthy as the first Russian psychological novel, this work (whose promised sequel never appeared) has considerable autobiographical interest.

The best editions of Lermontov's works are those by P. A. Viskovaty (1891), A. I. Vvedensky (1891), I. M. Boldakov (1891), and D. E. Abramovitch (1910–13). The last contains comprehensive biographical and bibliographical data. Most of Lermontov's works are available in French and German translations. Among the latter the work of F. F. Fielder is especially notable for its remarkable fidelity to the original. In English have appeared *The Hero of our Time,* translated by T. Pulszky (1854), anonymously (1854), by R. I. Lipmann (1866), and by Ivan Nestor-Schnurmann (Cambridge University Press, 1899)—the last two contain biographical sketches of the author, *The Circassian Boy* (*Mtsyri*), translated by S. S. Conant (Boston, 1875); and *The Demon,* translated by Stephen (London, 1875) and by Francis Storr (London, 1894). There is still no adequate literary study of this poet in English. A comprehensive bibliography is given in Wiener's *Anthology of Russian Literature* (New York, 1903).

LERNA, lĕr′nȧ, HYDRA OF, **LERNÆ′AN HYDRA.** See HERCULES; HYDRA.

LERNER, lĕr′nĕr, TINA (1890–). A Russian pianist, born at Odessa. She began her musical education at a very early age in her native town, and at six entered the conservatory at Moscow, where she remained until 1900. Thereupon she went for further study to Godowsky, and made her début in St. Petersburg (Petrograd) in 1903, meeting instantly with most emphatic success. Her European reputation dates from her tour of Germany in 1905. She made her first visit to the United States in 1908, when she was received with marked favor, which upon subsequent visits became enthusiastic admiration. In 1909 she was married to Louis Bachner, a member of the faculty of the Peabody Institute of Baltimore. She is remarkable for her command of tonal color and poetic insight and at her best in works of an intimate character.

LEROLLE, le-rŏl′, HENRI (1848–). A French painter, born in Paris. He studied under Lamothe and received a first-class medal at the Salon of 1880 and a gold medal at the Paris Exposition (1900). Among his works are: "The Communion of the Apostles" (1878); "At the Organ" (1885, Metropolitan Museum, New York City); and "In the Country" (1880), bought by the state; portrait of the artist's mother; "The Arrival of the Shepherds" (Carcasonne Ville and the Sorbonne, Paris). His favorite subjects are large landscapes with few figures, sympathetically and realistically executed but without much power. His effects of evening light are notable.

LE ROND, le rôɴ′, JEAN. See D'ALEMBERT.

LEROS, lĕr′ŏs, or **LERO,** lĕr′ô. An island of the Grecian Archipelago, one of the Sporades, under military occupation by Italy as a consequence of the Turco-Italian War (Map: Greece, H 6). It is situated about 30 miles south of Samos. Its area is estimated at from 20 to 25 square miles. The surface is hilly, the extreme elevation being 1086 feet above the sea, but the soil fertile, producing grapes, olives, and grain. Pop. (est.), 3000, mainly Greeks. The islanders are mainly engaged in the carrying trade and sponge fishing. The chief town, Leros or Marina, has a castle and about 1500 Greek inhabitants.

LE ROSSIGNOL, le rŏs′ĭ-nyŏl′, JAMES EDWARD (1866–). An American economist, born in Quebec, Canada. He graduated at McGill University in 1888 and at Leipzig (Ph.D.)

in 1892, and studied also at Clark University. At Ohio University he was professor of psychology and ethics (1892–94), at Denver professor of economics (1894–1911), and at the University of Nebraska, where he had temporarily held a chair in 1908–09, head professor of political economy (after 1911) and director of the School of Commerce (after 1913). He lectured at McGill in 1900 and at the University of Wisconsin in 1903 and in 1906 made investigations in New Zealand. He is author of *Monopolies, Past and Present* (1901); *Orthodox Socialism* (1907); *Little Stories of Quebec* (1908); *State Socialism in New Zealand* (1910).

LEROUX, le-rōō′, Hector (1829–1900). A French painter of classical subjects, born at Verdun. He studied under Picot and won the second Prix de Rome in 1857 with his "Lazarus." Many of his works are owned in America. The best include "A New Vestal Virgin" (1863, Museum of Verdun); "Columbarium" (1864, acquired by the state); "The Slave of Horace"; "Roman Ladies at the Tomb of their Ancestors" (Metropolitan Museum, New York); the very powerful "Messalina" (1868); the "Vestale Tuccia" (1874, Corcoran Gallery, Washington); "Amata"; "News from Outside" (1891); "Hagar and Ishmael" (1892); "Pericles and Aspasia Visiting Phidias"; "Joan of Arc at Domremy" (1900). He is not merely classical in his subjects, but seems to prefer the unromantic lack of action and absence of any emotion unless it be commingled with cold dignity.

LEROUX, Henri, called Hugues (1860–). A French journalist and romance writer, born at Havre. He contributed to the *Revue Politique et Littéraire*, the *Temps, Matin, Journal, Figaro*, etc., articles written in a peculiarly pleasing style, which also characterized his romances, such as *Un de nous* (1886), *Les larrons* (1890), *Les amants byzantins* (1897), *Le maître de l'heure* (1897), and *Le fils à papa* (1900). He published a book upon *La Russie souterraine* (1885) and a Nihilist novel, *L'attentat Sloughine*, the same year, but afterward turned his attention to the underground life of his own city and issued *L'enfer parisien* (1888). He visited the United States at the beginning of the twentieth century and lectured at Harvard. In 1915 he came again to America, to lecture on the attitude of France towards the European War. His more serious works include: *Notre patron Alphonse Daudet* (1888); *Les jeux du cirque et la vie foraine* (1889); *Portraits de cire* (1891); *Marins et soldats* (1892); *Les mondains* (1893); *Nos filles; qu'en ferons-nous?* (1898). Among his travel sketches are: *Au Sahara* (1891); *En yacht* (1892); *Notes sur la Norvège* (1894); *Prisonniers marocains* (1905). He adapted Dostoyevski's *Crime and Punishment* for the stage, besides writing the play *L'Autre France* with Decourcelle (1900) and the opera libretto *Le roi aveugle* (1906). Also in 1906 he wrote *L'Heureux ou l'heureuse.*

LEROUX, Pierre (1797–1871). A French radical publicist and philosopher, born in Paris. After studies at the Lycée Charlemagne he founded (1824) the *Globe*, an organ of literary and social reformers, which in 1831 became converted to the socialism of Saint-Simon. Leroux then (1832) became editor of the *Revue encyclopédique*, and in collaboration with Jean Reynaud undertook the *Encyclopédie nouvelle*, to continue the philosophic propagandism of the old *Encyclopédie*. (See Diderot.) In 1839 he summed up his philosophic creed in *De l'humanité, de son principe et de son avenir*, teaching development towards perfection. In 1841 he joined with George Sand and Viardot to found the *Revue Indépendante*, translated Goethe's *Werther* in 1843, and in 1848 was an ultraradical delegate to the National Assembly. After the coup d'état (1851) he sought refuge in Jersey and at Lausanne, but he returned in 1869. His more prominent writings were: *Du christianisme et de ses origines démocratiques* (1848); *Malthus et les économistes, ou y aura-t-il toujours des pauvres?* (1848); *Job*, a drama (1865).

LEROUX, Xavier Henri Napoléon (1863–). A French composer, born at Velletri, Italy. He was a pupil of Dubois and Massenet at the Paris Conservatory, and won the Prix de Rome in 1885 with his cantata *Endymion.* In 1896 he was appointed professor of harmony at the Paris Conservatory. He wrote a mass with orchestra, several motets, and a dramatic overture, *Harald.* But his importance rests upon his operas: *Evangéline* (1895), *Astarté* (1900), *La reine Fiammette* (1903), *Vénus et Adonis* (1905), *William Ratcliffe* (1906), *Théodora* (1906), *Le Chemineau* (1907). The last named was heard in the United States (New Orleans) in 1911. Two other operas, *Le carillonneur* and *La fille de Figaro*, are still in manuscript.

LE ROY. A village in Genesee Co., N. Y., 26 miles southwest of Rochester, on the Buffalo, Rochester, and Pittsburgh, the Erie, and the New York Central and Hudson River railroads (Map: New York, B 5). It is a manufacturing and residential town and produces salt, canned fruits, cotton goods, food products, medicines, and agricultural implements. There are also limestone quarries. The government is vested in a board of trustees, with the president, who is annually elected, as executive head. The water works are owned by the village. Le Roy was the home of Ingham University, one of the first colleges for women. Pop., 1900, 3144; 1910, 3771.

LEROY, le-rwä′, Jean Jacques Joseph, known as Leroy d'Etiolles (1798–1860). A French surgeon, born in Paris. In 1822, while a medical student, he invented a set of instruments for performing the operation of lithotrity (q.v.) and was the first successfully to perform that operation. His works include: *Exposé de divers procédés employés pour guérir de la pierre* (1825); *De l'extraction des corps étrangers* (1854); and his translation into French of Cooper's *Dictionary of Surgery.*

LE ROY, Marin. See Gomberville, Marin Le Roy, Sieur du Parc et de.

LEROY, William Edgar (1818–80). An American naval officer. He was born in New York City, entered the navy as midshipman in 1832, and became a commander in 1861, a captain in 1866, a commodore in 1870, and a rear admiral in 1874. He commanded the *Keystone State* in the engagement with Confederate ironclads off Charleston in January, 1863, and the *Ossipee* at the battle of Mobile Bay, on Aug. 5, 1864. From 1876 to 1879 he commanded the South Atlantic squadron, and in 1880 retired.

LEROY-BEAULIEU, le-rwä′-bō′lyẽ′, Anatole (1842–1912). A French publicist, brother of Pierre Paul, born at Lisieux (Calvados). He devoted himself to the study of the history of art and literature and published in 1866 *Une troupe de comédiens*, followed in 1875 by *La re-*

stauration de nos monuments historiques devant l'art et devant le budget. In 1811 he became professor of modern history at the Ecole Libre des Sciences Politiques and in 1887 was made a member of the Academy of Moral and Political Science. In the *Revue des Deux Mondes,* with which he became connected soon after the publication of his second work, he published a number of important political and social studies, subsequently reprinted in book form. Chief among these are *L'Empire des Tsars et les Russes* (1887–89), an excellent treatise on the history, politics, and social life of Russia, based on personal observation; *Un homme d'état russe* (*Nicolas Milutine*) (1884); *La France, la Russie, et l'Europe* (1888); *La Russie et la crise russe* (1908). Various phases of contemporaneous social development are treated in *Les catholiques libéraux, l'église et le libéralisme depuis 1830* (1885); *La révolution et le libéralisme* (1890); *Les juifs et l'antisémitisme, Israël chez les nations* (1893); *Les doctrines de haine: l'antisémitisme, l'antiprotestantisme, l'anticléricalisme* (1902); *Les congrégations religieuses et l'expansion de la France* (1903); *Christianisme et Socialisme and Christianisme et Démocratie* (1905).

LEROY-BEAULIEU, Pierre Paul (1843–1916). A French economist, brother of Anatole. He was born at Saumur, studied at Paris, Bonn, and Berlin, and later wrote for French publications. In 1867 he published his first large work, *L'Influence de l'état moral et intellectuel des populations ouvrières sur le taux des salaires.* In 1872 he became professor of finance at the Ecole Libre des Sciences Politiques, and in 1880 professor of political economy at the Collège de France. A leading exponent of free trade, he founded the *Economiste Français* in 1873. He was made a member of the Academy of Political and Social Science and an Officer of the Legion of Honor and received honorary degrees from Bologna, Edinburgh, Dublin, and Cambridge. Among his works are: *La colonisation chez les peuples modernes* (1873); *Précis d'économie politique* (1888); *L'Etat moderne et ses fonctions* (1889; Eng. trans., 1891); *Traité théorique et pratique d'économie politique* (1895); *Le Sahara, le Sudan et les chemins-de-fer transsahariens* (1904); *L'Art de placer et gérer sa fortune* (1906); *La question de population* (1913). His son, Pierre, published *Les nouvelles sociétés anglo-saxonnes* (1897); *Rénovation de l'Asie* (1900; Eng. trans., 1900); *Les Etats-Unis au XXe siècle* (1904; Eng. trans., 1906).

LERP INSECT. A term derived from an aboriginal word meaning 'sweet,' and referred to an insect (*Psylla eucalypti*) which has its habitat in the mallee regions of Victoria, Australia. Its secretion, a manna, is found on the leaves of the mallee (*Eucalyptus dumora*); and from it a chemical substance called *lerpamyllum* is derivable. (Consult second supplement to Watt's *Dictionary of Chemistry,* 1875.) According to Westgarth, the natives of the Wimmera prepared a luscious drink from the laap (or lerp) of the mallee. See Manna.

LERWICK, lĕr′wĭk *or* lĕr′ĭk. The chief town of the Shetland Islands (q.v.), Scotland, on Mainland, on Bressay Sound, 110 miles northeast of Kirkwall (Map: Scotland, G 1). Fishing is the chief branch of industry and is important. The harbor is large and safe. The town has a public pier 300 feet in length and is defended by Fort Charlotte, built in the time of Cromwell. Lerwick is one of the principal Scottish stations for the royal naval reserve, and the seat of the Shetland law courts. It contains a fine modern town hall (1881) with good stained-glass windows, an excellent secondary school known as the Anderson Institute, and a small picture gallery. Pop., 1901, 4061; 1911, 4664.

LÉRY, lå′rĕ′, Jean de (1534–1601). The first Protestant minister who preached on the American continent. He was a Calvinist and, with others, was sent from Geneva in 1556 to preach among the Huguenot colonists at Rio de Janeiro, by Coligny and Villegagnon. The ministers and the patron quarreled. After many sufferings and dangers they returned to France. Léry wrote *Histoire d'un voyage fait en la terre du Brésil* (1578).

LESAGE, le-säzh′, Alain René (1668–1747). A French novelist and dramatist, born in Sarzeau, Brittany, May 8, 1668, famous for his *Gil Blas.* Left an orphan at 14 and despoiled by his uncles of his patrimony, he went to Paris in 1690, studied for the law, married in 1694, gave up law for letters, won the patronage of the Abbé de Lyonne, from whom he received a pension of 600 livres, and supported himself by hack work in not always faithful translations from the Spanish (*Théâtre Espagnol,* 1700; Avellaneda's unauthorized *New Adventures of Don Quixote,* 1704; etc.). Lesage's original work in both fiction and drama begins with 1707 with the comedy *Crispin, rival de son maître,* and the novel *Le diable boîteux,* the idea for which was borrowed from Guevara's *Diablo Cojuelo* (1641) and the details from other sources, though none could question the originality of its wit and spirit. Then followed Lesage's greatest comedy, *Turcaret* (1709). In this play Lesage fiercely assailed the taxgatherers or *traitants.* Such was their power that they could keep this play off the stage for a while, but the Dauphin took sides with Lesage and *Turcaret* was put on. His trouble with the Théâtre Français led him to work thereafter for the rival and inferior Théâtre de la Foire, for which Lesage wrote a host of farces and light operettas, once popular but now forgotten, giving his ripest thought meantime to *Gil Blas,* his greatest novel, begun in 1715, continued in 1724, completed in 1735, and revised in 1747. *Gil Blas* is derived in part from the following works: *Disgrazia del conte d'Olivare,* in a French translation; from a French work founded on the *Anecdotes du comte-duc d'Olivares,* by M. de Valdory; from the *Histoire du comte-duc avec des réflexions politiques et curieuses* (Cologne, 1683). Lesage also borrowed from the life of Obregon and from a number of Spanish narratives or plays. The *Lazarillo de Tormes* is a prototype of *Gil Blas.* The borrowed episodes of *Gil Blas* constitute about one-fifth of the whole. It tells the story of a young rogue who is cast upon the world and has innumerable adventures which he recounts in a light, satirical, low, and often cynical vein. Lesage wrote also a French adaptation of the Spanish *Guzman d'Alfarache* (1732), a picaroon novel, and the similar though more independent picaroon stories, *Estevanille Gonzales* (1734) and *Le bachelier de Salamanque* (1736), as well as *Les aventures du chevalier de Beauchesne* (1732), founded on contemporary memoirs, all works little read, and not likely to be much read, but not without interest as experiments in realistic fiction.

Lesage's domestic life was happy and uneventful. He lived respectably, on the borderland of Bohemia, and if he died poor it was rather because he was independent than because he was reckless, his good humor being always restrained by a sane judgment. In his lifetime, though always popular, he was enjoyed rather than appreciated, for, though not a creative genius, he was so keen an observer and so remarkable an assimilator as to be in several ways an innovator; not the father of realism, but its prophet. *Le diable boîteux* is a satire on contemporary Parisian society, under a Spanish veil, owing more to La Bruyère's *Caractères* than to Guevara. Keys were soon provided in abundance, and even now the allusions to Fontenelle, Ninon de l'Enclos, Voltaire, and others are unmistakable. *Crispin* and *Turcaret,* too, are prose pictures of Parisian life, the former farcical, the latter a cruelly realistic satire on mercantile pettiness, provincial narrowness, and most of all on the new plutocracy. This satiric realism finds its final expression in *Gil Blas,* the story of a self-made man and studied more from French life than from any Spanish romance. At least four men were then living in France—Dubois, Alberoni, Barjac, and Gourville—valets or favorites, whose adventures might have suggested those of Lesage's Spanish hero. The story aims, through the experiences of a checkered life, to show how character is formed by environment, how impressions rouse reflection, reflection stirs conscience, and both react on conduct so as gradually to transform it. That is the moral, and to draw it Lesage paints the world as he finds it with keen understanding and the charity of wisdom. So *Gil Blas* has endured for nearly two centuries as a gospel of a worldly-wise man's common sense. Lesage's permanence in French literature seems more assured to-day than at any time since his death, which occurred in Paris, Nov. 17, 1747.

Lesage's works are best edited by Renouard in 12 volumes (1821), to be supplemented by *Le Théâtre de la Foire* (10 vols., 1737) and unpublished manuscripts in the French National Library.

Bibliography. Ferdinand Brunetière, *Critiques,* vol. iii (Paris, 1880); C. A. Sainte-Beuve, *Causeries de lundi,* vol. ii (ib., 1881); Emile Faguet, *Dix huitième siècle* (ib., 1885); V. Barberet, *Lesage et le Théâtre de la Foire* (Dijon, 1887); Leo Claretie, *Lesage, romancier* (ib., 1890); G. E. B. Saintsbury, *Essays on French Novelists* (London, 1891); Eugène Lintilhac, *Grands écrivains français* (Paris, 1893).

LES′BIA. The name under which Catullus in his love poems celebrates the beautiful and shameless Clodia.

LESBIAN POETS, The. A term used to designate the four poets of Lesbos, Terpander, Alcæus, Arion, and Sappho.

LESBOS, lĕz′bŏs. An island in the Ægean sea, midway between Smyrna and the Dardanelles. It was formerly part of the Ottoman Empire, but was taken over by Greece in 1913 after the Balkan wars had resulted in Turkey's defeat. Since then it has remained in Greek hands. The island is frequently called Mytilene from the name of its chief city in ancient and modern times (now also called Kastro) (Map: Greece, F 2). Area, about 675 square miles. It is mountainous and densely forested and is nearly cut in two by the Bay of Kalloni, that indents from the southwest; the highest peak is Mount Olympus (Hagios Elias), reaching an altitude of 3077 feet. The principal products are olive oil (about 15,000 metric tons a year), valonia, figs, and almonds, and there are tanneries, and silk and soap factories. The imports are grain, flour, sugar, tobacco, alcohol, sulphur, and petroleum. Population about 130,000, of whom about 90 per cent are Greek. Mytilene has upwards of 50,000 inhabitants. Lesbos is famous as the birthplace of the poets Sappho, Alcæus, Terpander, and Arion, of the statesman Pittacus, of the historian Hellenicus, and of the philosophers Theophrastus and Phamas. For the ancient history of the island, see the article on the city of Mytilene, the capital. In 1354 Lesbos was conveyed by the Byzantine Emperor to Francesco Gattilusis, a Genoese noble, whose descendant, in 1462, lost it to Mohammed II. In 1690–98 the Venetians, and in 1821 the Greeks, defeated the Turks in naval battles here. Consult H. F. Tozer, *Islands of the Ægean* (London, 1890), and Georgeakis and Pineau, *Le Folk-lore de Lesbos* (Paris, 1894).

LESCARBOT, lĕ′skär′bŏ′, Marc (c.1570–1630). A French traveler and writer, born at Vervins. He studied law and became an advocate before the Parliament of Paris. With his friend Pontrincourt he went to Canada in 1605 to relieve the settlement at Port Royal. After the monopoly of the fur trade was broken, the settlement was abandoned, and in 1607 he returned to France, where he published *Histoire de la Nouvelle France* (Paris, 1609; 2d ed., 1612). The edition of 1618 contains in addition *Muses de la Nouvelle France.* The history describes the voyages of Verazzani, the settlement in Florida, the expedition to Brazil, and De Monts's colony in Acadia, the last being the first attempt to found an agricultural colony in America. Later he was secretary of the French Embassy in Switzerland and wrote some books of travel. Consult H. P. Biggar, "Marc Lescarbot of Vervins, the French Hakluyt," in the *American Historical Review,* vol. vi (New York, 1901).

LESCAUT. See Manon Lescaut.

LESCHES, lĕs′kēz (Lat., from Gk. Λέσχης). One of the so-called cyclic poets (q.v.), who flourished in the earlier half of the seventh century B.C. He was born at Pyrrha, near Mytilene, and is usually regarded as the author of the epic entitled *The Little Iliad* (Ἰλιὰς ἡ ἐλάσσων, or Ἰλιὰς μικρά), in four books. This poem, which was intended as a supplement to the *Iliad* of Homer, narrated the events after the death of Hector—the contest of Ulysses and Ajax for the arms of Achilles, the fate of Ajax, the exploits of Philoctetes, Neoptolemus, and Odysseus, and the final destruction of Troy. From the last part of the work, which, like the first part of the poem of Arctinus, was called *The Destruction of Troy* (Ἰλίου Πέρσις), Pausanias makes several quotations describing the sacking of Troy and the taking away of the prisoners. Consult: Aristotle, *Poetica,* 23; Müller, *Fragmenta Historicorum Græcorum* (Paris, 1868–83); D. B. Monro, edition of *Odyssey,* xiii–xxiv, pages 362–371 (Oxford, 1891); Christ-Schmid, *Geschichte der griechischen Litteratur,* vol. i (6th ed., Munich, 1912).

LESCHETIZKY, lĕsh′e-tĭts′kĭ, Theodor (1831–1915). An Austrian pianist, born in Lancut, near Lemberg, Galicia. As a piano virtuoso he was very favorably received in London, Holland, Berlin, and Vienna; and in a lesser degree for his compositions, which include *Souvenirs* *d'Italie*, *Suite à la campagne*, and many other similar pieces, as well as an opera, *Die erste Falte*, first given in Prague in 1867, and afterward at Wiesbaden in 1881. He became especially famous as a teacher—one of Paderewski's principal instructors, he gained great popularity among American students abroad. His own teachers were his father, Czerny, and Sechter. In 1852 he joined the faculty of the St. Petersburg Conservatory, and acted as conductor of the orchestra of the Grand Duchess Helen during the absence of its regular conductor, Rubinstein. Ill health compelled him (in 1878) to leave the country. In 1880 he took up his residence in Vienna as a teacher. Consult A. Potocka, *Th. Leschetizky* (New York, 1903), and Annette Hullah, *Theodor Leschetizky* (London, 1906).

LESCOT, l*e*-skō′, Pierre (c.1510–78). One of the greatest French architects of the Renaissance. Little is known of his life. He was born between 1510 and 1515 and is called a Parisian by Jean Goujon in his introduction to Martin's translation of Vitruvius. His praises were sung by the poet Ronsard, who wrote him an epistle from which we know that he was Seigneur de la Grange du Martroy, Seigneur de Clagny, Abbé Commendatoire de Clermont (1554), and canon of the cathedral of Notre Dame, Paris. His first known work was the rood screen of St. Germain l'Auxerrois, Paris (1541–44), and he designed the architectural part of Jean Goujon's Fountain of the Innocents, in Paris. The plans for Hotel Carnavalet, Paris, are also attributed to him. His masterpiece was the southwest angle of the Louvre, begun in 1546, by which the renovation of the old Gothic palace was commenced. Lescot was the real founder of the purely classic school in France, previous work having been mainly the result of an amalgamation of Gothic and classic elements. The view advanced by Reginald Blomfield in his *History of French Architecture* (London, 1911) that Lescot was no real architect, but a clever courtier and business manager, who employed Goujon (q.v.) to design all his architecture, has not found general acceptance although presented with much learning. Consult the work just cited, also Adolphe Berty, *Les grands architectes français* (Paris, 1860), and Léon Palustre, *La renaissance en France* (ib., 1880).

LESDIGUIÈRES, lȧ′dē′gyâr′, François de Bonne, Duc de (1543–1626). An able French general, born at Saint-Bonnet-de-Champsaur and educated at Avignon and at Paris in the Collège de Navarre. He suddenly gave up the law and entered the army under Bertrand de Gordes, but soon left it to join the Protestant party. He was in the thick of the religious civil war and did much for the cause of Henry IV by carrying on a guerrilla warfare in the mountains. He commanded the King's armies against Charles Emmanuel I of Savoy with great success (1591–92); and in 1597 raised an army at his own expense, beat the Spaniards, and in the following year again defeated the Duke of Savoy. He succeeded in making himself practically ruler of Dauphiné, although his dictatorship was looked upon with some distrust by Henry. He was made marshal of France in 1608, and three years afterward Duke of Lesdiguières. Under Louis XIII Lesdiguières fought for the cause of Savoy against the Spaniards. He finally abjured Calvinism and commanded against the Huguenots, being rewarded for his services by being made Constable of France and a member of the Order of St. Esprit. Consult Dufayard, *Le connétable de Lesdiguières* (Paris, 1892).

LESE MAJESTY, lēz mȧj′ĕs-tĭ (Fr. *lèse-majesté*, from *léser*, to injure + *majesté*, majesty, from Lat. *læsa*, p.p. of *lædo*, to hurt + *majestas*, greatness, dignity), or **LEZE MAJESTY.** In the most general sense, any act tending to injure or impair the dignity or respect of the sovereign. At the common law and to-day in England, as well as in the United States, such an act is cognizable as an offense only when it is grave enough to amount to treason. But in Germany and perhaps some other continental countries lese majesty comprehends even such minor offenses as the publication or public utterance of words derogatory to the administration of the state or to the person of the reigning sovereign. See Treason; Liberty of the Press; Libel.

LES EYZIES, lā-zā′zē′. See Paleolithic Period.

LESGHIANS, lĕz′gĭ-*a*nz, or Lesghian-tchetchen. A group of peoples of the Caucasus, approximately numbering 600,000, comprising the eastern division of Lesghians proper, the more central Tchetchenzes, and some other peoples, whose exact relations are still somewhat in doubt. The Lesghians, who mainly inhabit Daghestan (sometimes called Lesghistan), comprise the Avars, Dargha, Kurins, Kazi-Kumuks, and other tribes. The Tchetchenzes comprise the Tchetchenzes proper, the Karabulaks, Ingushes, Tushes, etc. The Georgian name for the Tchetchenzes is Kists (q.v.). They call themselves Naktchuoi. Some authorities (Müller, 1879; Brinton, 1890) classify the Lesghians and Kists (Tchetchenzes) as two different groups. Keane (1896) considers that some of the languages of this region of the Caucasus, as the Ude, Kubachi, Andi, etc., "must for the present be regarded as so many stock languages," while according to Uslar some of the languages of southern Daghestan are practically "inflectional." The Lesghian group includes many of the wilder and more independent tribes of the Caucasus. Shamyl, whose capture by the Russians in 1859 ended a thirty years' heroic struggle for Lesghian independence, was an Avar. Their physical features, too, are less prepossessing than those of the Georgians, Circassians, etc. The Lesghians (particularly the eastern tribes) are very brachycephalic, with a fairly high stature. The face sometimes suggests Mongolian admixture, the nose Semitic. Light-gray eyes and fair hair are rather common among them. They are an intelligent, brave, and hardy people. Hunting, cattle breeding, smithing, and carpet weaving are their chief occupations. The Lesghians have been converted to Islam. Anthropological and ethnological information about the Lesghians will be found in the following works: Wagner, *Schamyl* (Leipzig, 1854); id., *Die Völker des Kaukasus und ihre Freiheitskämpfe gegen die Russen* (Berlin, 1855); Sir A. T. Cunninghame, *Eastern Caucasus* (London, 1872); Rittich, *Die Ethnographie Russlands* (Gotha, 1878); Erckert, *Der Kaukasus und seine Völker* (Leipzig, 1885); Chantre, *Recherches anthropologiques dans le Caucase* (Lyons, 1885–87); De Morgan, *Recherches sur les Origines des Peuples du Caucase* (Paris, 1889); Hutchinson and others, *Living Races of Mankind* (London, 1901); and the ethnological map of Daghestan, published by Komarov.

LE SICILIEN, ou L'Amour Peintre, le sē̆'-sē̆'lyäN' o͞o lȧ'mo͞or' păN'tr' (Fr., The Sicilian, or Love as a Painter). A comedy by Molière (1667).

LESKIEN, lĕs'kē-*e*n, August (1840–). A German philologist. He was born at Kiel and studied there, at Leipzig, and at Jena, where he specialized in Slavic linguistics under Schleicher (1866–67), and where he was made assistant professor of comparative philology in 1869. A year later he went to Leipzig to give the first course there in Slavic languages. With Burgmann he edited *Litauische Volkslieder und Märchen* (1882). In 1884 he became an editor of Ersch and Gruber's *Realencyklopädie.* His other writings include: *Indogermanische Chrestomathie* (1869), with Ebel, Schleicher, and Schmidt; *Handbuch der altbulgarischen Sprache* (5th ed., 1910); *Die Deklination im Slawisch-Litauischen und Germanischen* (1876); *Ablaut der Wurzelsilben im Litauischen* (1884); *Untersuchungen über Quantität und Betonung in den slawischen Sprachen* (1885–93); *Die Bildung der Nomina im Litauischen* (1891); *Grammatik der altbulgarischen Sprache* (1909).

LESKOV, Nicholas. See Lieskov, Nikolai Semionovitch.

LES'LEY, or **LESLIE,** John (1527–96). A Scottish prelate, statesman, and historian, the natural son of the parish priest of Kingussie, Inverness-shire. He graduated M.A. at King's College, Aberdeen and studied later at Poitiers, Toulouse, and Paris. In 1547, in his twentieth year, he became a canon of Aberdeen Cathedral. In 1549 he went to France, where he studied canon and civil law at the universities of Poitiers and Paris. He returned to Scotland in 1554 to take up an appointment as professor of canon law in his alma mater, and in 1559 he was appointed canon and prebendary of Oyne. He was a strenuous opponent of Knox and of the introduction of Protestantism into Scotland, and was one of the commissioners sent to invite Queen Mary to Scotland; on her accession he became her chief ecclesiastical adviser, and in 1566 was made abbott of Lindores and in the same year Bishop of Ross. His loyalty to his Queen subjected him to much dangerous intrigue, and after her imprisonment in Bolton Castle, in 1568, he went to plead her cause at the court of Elizabeth. In 1571 he was imprisoned in the Tower of London for complicity in the projected marriage of Mary to the Duke of Norfolk, for his share in the resulting uprisings in the north of England, and for his attempts to secure Spanish intervention. The confession extorted from him led to Norfolk's execution. In 1573 he was released by Elizabeth, but was banished from the Kingdom. He went to France, and continued to intercede, but unsuccessfully, for his Queen at various continental courts until her death. He visited Rome and received several traveling commissions from the Pope. In 1579 he was appointed suffragan and vicar-general of the diocese of Rouen, where in 1591 his efforts in stimulating the citizens to resist successfully the siege during the Civil War were rewarded by Clement VIII, who appointed him Bishop of Coutances. The disturbed state of the country, however, prevented him from proceeding to his see, and he retired to the Augustinian monastery of Guirtenburg, near Brussels, where he died. He was the author of several Latin and English publications, many of them written in defense of Queen Mary. His most important work is *De Origine, Moribus et Rebus Gestis Scotorum* (10 vols., Rome, 1578), a Latin abridgment in several volumes of the work of Boëthius, with three original volumes in the Scottish dialect, dealing with the period from the death of James I in 1437 to the return of Queen Mary to Scotland in 1561. Consult Andrew Lang, *History of Scotland* (New York, 1904–07).

LESLEY, (John) Peter (1819–1903). An American geologist, born in Philadelphia. He graduated from the University of Pennsylvania in 1838, spent three years assisting Henry D. Rogers in the first geological survey of Pennsylvania, and in 1844 graduated from Princeton Theological Seminary. From 1845, when he returned to the United States after further study at Halle, to 1848 he was a religious worker among the Pennsylvania mountaineers. For two years he served as pastor of a Congregational church at Milton, Mass., then returning to Philadelphia and to his earlier geological interests. He made extensive and important researches in the coal, oil, and iron fields of the United States and Canada and became State geologist of Pennsylvania in 1874. From 1872 to 1878 he served as professor of geology at the University of Pennsylvania; after 1886 he was emeritus professor. The year 1863 he spent in Europe, examining the Bessemer ironworks for the Pennsylvania Railroad Company, and in 1867 he was commissioner to the World's Fair in Paris. In 1884 he was president of the American Association for the Advancement of Science. Besides the many volumes of geological reports which he wrote or edited as State geologist of Pennsylvania, and numerous papers in scientific magazines, he published: *A Manual of Coal and Its Topography* (1856); *The Iron Manufacturer's Guide* (1858); *Historical Sketch of Geological Explorations in Pennsylvania* (1876); *Paul Dreifuss, His Holiday Abroad* (1882). Consult M. L. Ames, *Life and Letters of Peter and Susan Lesley* (2 vols., New York, 1909).

LESLIE, A. See Leven, Earl of.

LESLIE, Charles (1650–1722). A British Jacobite nonjuror and controversialist. He was born in Dublin, Ireland, July 17, 1650, graduated at Trinity College, Dublin, removed to England in 1671 and began the study of law at the Temple, but soon abandoned this for divinity and was admitted to orders in the Church of England in 1680. Returning to Ireland, he was appointed, in 1687, chancellor of Connor. Living in Ireland at the time of the Revolution, he distinguished himself in disputations with the Roman Catholics in defense of Protestantism. Though a zealous Protestant, he adhered to King James, refusing to acknowledge William as his rightful sovereign. After the death of James II he transferred his allegiance to his son, the Pretender, and was sent by some opulent Jacobite gentlemen, in 1709, to Bar-le-Duc to convert him; when the Pretender removed to Italy he accompanied him. In 1721 he obtained permission from George I to return to his native land and took up his abode at Glaslough, Ireland, where he died on April 13, 1722. His theological works excited much attention and have been frequently reprinted. The most prominent are: *Gallienus Redivivus* (1695), which gives the facts of the massacre of Glencoe; *The Snake in the Grass* (1696); *A Short and Easy Method with the Deists* (1698); *A Short and Easy Method with the Jews* (1699); *The Truth of Christianity Demonstrated* (1711). In his political controversies he was the advocate of high monarchical principles. His collected works were published in two volumes (London, 1721), and reprinted in seven volumes (Oxford, 1832). Consult R. J. Leslie, *Life and Writings of Charles Leslie* (London, 1885).

LESLIE, Charles Robert (1794–1859). An American genre painter who practiced in London. He was born in London, Oct. 19, 1794, of American parentage. His father, a watchmaker of Philadelphia, died in 1803, upon his return to that city, leaving his family destitute. Charles Robert was apprenticed to a bookseller, but evinced great aptitude for drawing, and at the age of 17 he drew a portrait of the actor George Frederic Cooke, which was esteemed so excellent that a subscription was raised to enable him to study abroad for two years. In 1811 he went to London and was hospitably received by Benjamin West, president of the Royal Academy. He became one of a group of notable men, among whom were Allston, Coleridge, West, Washington Irving, and John Constable.

His first picture exhibited at the Academy was a melodramatic production, entitled "Murder" (1813). Not until after his visit to Paris, in 1817, did he exhibit his special talent, the painting of humorous historical genre, in his "Sir Roger de Coverley Going to Church." During this period he designed illustrations for Irving's *Knickerbocker History of New York* and *Sketch-Book*, also painting his portrait. In 1822 "Mayday Revels in the Time of Queen Elizabeth" secured his election as an associate of the Academy. In company with Sir Edmund Landseer he visited Sir Walter Scott at Abbotsford in 1824 and painted his portrait. In 1825 he married Miss Stone, a celebrated beauty, and in 1826 he became an Academician. Elected professor of drawing at West Point in 1833, he returned to London after a trial of a few months. In 1838 he was summoned to Windsor to paint the "Queen Receiving the Sacrament after the Coronation," now in Buckingham Palace. He was professor of painting at the Royal Academy from 1848 to 1852, and published his admirable lectures to the students as a *Handbook for Young Painters* (1855). Other works are: *The Memoirs of Constable* (1865), whose merits he was among the first to recognize; an incomplete *Life of Reynolds* (1865); and his own *Autobiographical Recollections* (1860), the two last edited by Tom Taylor. Leslie died at St. John's Wood, London, May 5, 1859.

Leslie is chiefly famous as an illustrator of humorous incidents taken from the great authors. His humor is refined and delightful, and no one has entered more into the spirit of the author. He is a good draftsman and a skillful composer, but the coloring, especially in his later works, is sometimes harsh. The shadows are too black, and there are no middle tones to harmonize them with the light portions. The best known of his pictures is "Uncle Toby and the Widow Wadman" (1831), in the Tate Gallery, London, which possesses also "Falstaff Impersonating the King," "Anne Page and Slender," "Viola and Olivia," portrait of Millais, besides sketches, studies, and replicas, including "Sancho Panza and the Duchess." The South Kensington Museum contains, besides replicas, three subjects from Molière, "The Dinner at Mr. Page's House" (1838), and others. In the collection of Lord Leconfield at Petworth, in Sussex, are the originals of the "Taming of the Shrew" (1832, replica at South Kensington), "Sancho Panza in the Apartments of the Duchess" (1828), and three others. Two of the Sir Roger de Coverley series are at Bowood, in the collection of the Marquis of Lansdowne. In the Philadelphia Academy are a number of replicas and the original of the "Murder of Rutland"; and in the Metropolitan Museum, New York, the portrait of Dr. J. Wakefield Francis. Consult Leslie's *Autobiographical Recollections* (London, 1860).

LESLIE, Frank (1821–80). The name assumed by Henry Carter, an American publisher and journalist, born in Ipswich, England. Son of a glove manufacturer, educated in Ipswich, trained to commerce in London, he showed a natural bent for art and contributed sketches to the *Illustrated London News*, signing them Frank Leslie. These were so cordially welcomed that he gave up commerce and was made superintendent of engraving on that journal. He made himself an expert and inventor in his new work, in 1848 came to the United States, and in 1854 began publishing the first of his many illustrated journalistic ventures, *The Gazette of Fashion. The New York Journal* soon followed, with *Frank Leslie's Illustrated Newspaper* (1855) (now *Leslie's Weekly*), *The Boy's and Girl's Weekly*, *The Budget of Fun*, and many others. He was commissioner to the Paris Exposition of 1867 and received a prize there for his artistic services.

LESLIE, Mrs. Frank, Baroness de Bazus (1828–1914). An American publisher and author, born in New Orleans. Her maiden name was Miriam Florence Folline and she was a descendant of a noble French-Huguenot family, from which she took her title late in life. When Frank Leslie, the publisher, to whom she had been married, died in 1880, leaving his business badly involved, Mrs. Leslie took it in hand and placed it on a paying basis. Before going on a European tour she saw the enterprise syndicated, but on her return she was obliged to effect a reorganization, with herself as president. The circulation of the *Popular Monthly* increased 200,000 in four months under her management. In 1902 she sold out all her publishing interests. In 1891, while abroad, Mrs. Leslie married William Wilde, a brother of Oscar Wilde, but two years later was divorced from him. She was also supposed to have been married several times before meeting Mr. Leslie. By her will she made Mrs. Carrie Chapman Catt (q.v.) residuary legatee, in the expectation that most of her fortune, estimated at more than $1,000,000, would be devoted to woman suffrage. Relatives contested the will. Mrs. Leslie was author of: *From Gotham to the Golden Gate* (1877); *Rents in our Robes* (1888); *Are Men Gay Deceivers? and Other Sketches* (1893); *A Social Mirage* (1899).

LESLIE, Henry David (1822–96). An English composer and conductor, born in London. He studied music with Charles Lucas, became honorary secretary of the Amateur Musical Society in 1847, and served as its conductor from 1853 to its dissolution in 1861. In 1855 he founded the Henry Leslie's Choir, and was its conductor until 1880, when it disbanded. In 1878 it had won the first prize at the Paris International Competition, and in 1882 the society reorganized, only to break up again five years later. In addition, Leslie for a time conducted the Herefordshire Philharmonic Society and the Guild of Amateur Musicians. His compositions, especially the sacred ones, are of considerable merit and include the operas, *Romance, or Bold Dick Turpin* (1857), *Ida* (1864); the oratorios, *Immanuel* (1853), *Judith* (1858); the cantatas, *Holyrood* (1860), *Daughter of the Isles* (1861); a Te Deum and Jubilate in B (1864); etc. He died in Wales.

LESLIE, John. See Lesley, John.

LESLIE, Sir John (1766–1832). A Scottish natural philosopher and mathematician. He was born in Largo, Fife, and was educated at St. Andrews University. In 1785 he entered the Edinburgh Divinity Hall, but devoted much of his time to the sciences, particularly chemistry. In 1788 he left Edinburgh, having given up all idea of following the Church, and after being two years in America as tutor to the sons of a Virginia planter, he returned to London in 1790. From that time till 1805 he was employed in private teaching, traveling, writing, and making experimental researches. His most important work during this period was a translation of Buffon's *Natural History of Birds* (1793), the invention of a differential thermometer, a hygrometer, and a photometer, and the publication of an *Experimental Inquiry into the Nature and Propagation of Heat* (1804), in which were contained his discoveries in the radiation of heat. For this research he became noted, and the Royal Society awarded him the Rumford medals. In March, 1805, after much opposition from the Edinburgh clergy, he was elected professor of mathematics in the University of Edinburgh; and soon after commenced the publication of his *Course of Mathematics*. In 1810 Leslie invented the process of producing cold artificially and froze water by using an air pump and sulphuric acid. (See Liquefaction of Gases.) In 1813 he published a full explanation of his views on the subject; subsequently he discovered a method of freezing mercury. In 1819 he was transferred to the chair of natural philosophy, a position better adapted to his peculiar genius, and in 1823 published one volume of *Elements of Natural Philosophy*, never completed. In 1832 he was knighted, and on November 3 of the same year died at Coates, a small estate which he had purchased near Largo. Besides the instruments above mentioned, he invented an æthrioscope, a pyroscope, and an atmometer.

LESLIE, Thomas Edward Cliffe (1827–82). An Irish economist, born in County Wexford. He was educated at Trinity College, Dublin, and was called to the English bar, but did not practice, as he was elected professor of jurisprudence and political economy at Queen's College, Belfast. A pupil of Maine, he put great stress on the historical study of economics and jurisprudence and specialized in the study of landownership. His *Land System and Industrial Economy of Ireland, England, and Continental Countries* (1870) includes a discussion of the conditions in Belgium and France and insists on the economic superiority of small holdings to the landlord system. A serious loss of manuscript blocked Leslie's scheme for a history of English economics, but he wrote valuable contributions to the gold question and economic method in *Essays in Political and Moral Philosophy* (1879) and contributed largely to periodicals.

LES MISÉRABLES. See Misérables, Les.

L'ESPINASSE, or **LESPINASSE,** lĕs'pē'näs', Julie Jeanne Éléonore de (1732–76). A French writer of remarkable *Letters* and a social leader, born at Lyons. She was the illegitimate daughter of the Countess of Albon. From 1754 to 1764 she lived as companion with the blind Madame du Deffand (q.v.) and presided with her over a fashionable literary salon. They then separated, not amicably, and with the aid of literary friends, especially D'Alembert, with whom L'Espinasse maintained till her death a close though platonic relation, she set up a rival salon as a centre for the younger philosophic school. It was two years after this independent life began, and when L'Espinasse was already 34, that she began to write the letters which have made her famous. The early ones are addressed to a Spaniard, Marquis Gonsalvo de More; the later, to Count de Guibert. Both breathe an ardent though unmerited devotion, and are in their kind little classics of passion. They were published by Guibert's widow in 1800. Consult: Asse, *Mlle. de Lespinasse et Mme. du Deffand* (Paris, 1877), and Ségur, *Julie de Lespinasse* (Paris, 1906). The career of Mademoiselle de L'Espinasse serves as the groundwork for a novel by Mrs. Humphry Ward, *Lady Rose's Daughter* (1903). The *Letters* appeared in English dress at Boston in 1903.

LESQUEREUX, lå'ke-rē', Leo (1806–89). An American botanist, born at Fleurier, Switzerland, of French-Huguenot ancestry. After several years at the academy of Neuchâtel, he went to Eisenach as a teacher of French. Upon his return to Switzerland he became principal in a school at La Chaux de Fonds, but, owing to deafness, he had to give up teaching. His old love of plants led him to study botany as opportunity came, and he published a catalogue of mosses, and later won a prize for a treatise on peat bogs. These monographs won him the friendship of Louis Agassiz and enabled him to travel over northern Europe studying the formation of peat and of coal. In 1848 he went to the United States, lived with Agassiz at Cambridge for a time, and then became the assistant of William S. Sullivant. The two, after expeditions into the mountains of the South, published *Musci Americani Exsiccati* (1856) and *Icones Muscorum* (1864). Afterward Lesquereux again took up his study of coal formation, traveled in Ohio, Pennsylvania, Kentucky, Illinois, and Arkansas, and worked on the geological surveys of these States. Among his reports the "Catalogue of the Fossil Plants which have been named or described from the Coal Measures of North America," the first and the second reports of the Pennsylvania Geological Survey (1880), is the most important work in this field. He also wrote: *Contributions to the Fossil Flora of the Western Territories* (1874–83); *The Flora of the Dakota Group*, edited by F. H. Knowlton (1891); and, with Thomas P. James, the continuation of Sullivant's work, *Manual of the Mosses of North America* (1884). He became entirely deaf in middle life, but was an expert lip reader.

LESSEPS, lĕ'sĕps', *Fr. pron.* lå'sĕps', Ferdinand, Viscount de (1805–94). A French diplomat and engineer, celebrated for the promotion and construction of the Suez Canal. He was born in Versailles, was early employed in the consular service and served as Consul at Cairo, Rotterdam, Malaga, and Barcelona. In 1848–49 he was Minister to Spain. In 1832, while De Lesseps was in Egypt on a visit forced by a quarantine, the idea of constructing a canal across the Isthmus of Suez occurred to him, as it had earlier to Napoleon. He became the friend of Said Pasha, who was later Viceroy, and whose assistance and encouragement were afterward of greatest aid to him. The project of constructing the great intersea canal at Suez remained practically in abeyance until 1854, an interval during which De Lesseps was engaged in diplomatic service. He then again visited Egypt, and in the same year (1854) the Viceroy granted him a concession for the proposed canal and promised the financial assistance of the Egyptian government. His plan of construction, calling for direct communication between the Mediterranean and the Red seas, he defended in a memorial entitled *Percement de l'isthme de Suez, exposé et documents officiels.* Political and engineering objections rendered the success of the project long doubtful and the task of De Lesseps extremely difficult. English engineers were skeptical as to the practicability of the scheme, and the English government, fearing the opening of a shorter route to India which would be under alien control, influenced the Turkish authorities to refuse their consent. M. de Lesseps, however, won the support of Emperor Napoleon III and Empress Eugénie, to whom he was related, and, having secured financial backing, triumphed over all obstructions. Work was actually begun in 1859, and it was finished 10 years later. The formal opening of the canal occurred Nov. 16–20, 1869. De Lesseps, who as president of the company had displayed remarkable engineering and executive ability, was given many honors.

After leaving Suez, De Lesseps was connected with attempts to reclaim the Sahara desert, to construct a canal through the Isthmus of Corinth, and to build a railroad uniting Europe with India. He was also associated with the movement to cut the Panama Canal. His prestige and success at Suez pointed him out as the logical person to direct the new effort. In 1879, at a congress of geographical and engineering experts, it was decided to construct the Panama Canal, and De Lesseps was designated for the presidency of the company contemplated. This company was formed and purchased the Wyse concession, which had been secured from Colombia in 1876. Although of advanced age, De Lesseps entered into the scheme with enthusiasm. His plan, at first, was to build a sea-level canal, but the great and practically insuperable difficulties connected with the Culebra cut and with the regulation of the fluctuating water supply from the Chagres River later caused him to change in favor of locks. The company was formed, with a membership of probably 200,000 persons, and work was begun in 1881. (See Panama Canal.) From the first, the management of the undertaking was characterized by laxness and inefficiency, and expenditures were made with great extravagance. Concerning the developments that followed there has been considerable difference of opinion. As time went on, it became apparent that the canal could not be completed with the available capital, and in 1888 the company was seen to be bankrupt. A liquidator was appointed and took over the management. Scandals concerning the direction of affairs and the financial administration became public, and judicial investigations were begun. That there had been frauds was clearly established, and innocent people had suffered in consequence, but just how far De Lesseps was connected with them and was responsible has remained in doubt. The excitement of the time, however, demanded a victim. In 1893 De Lesseps and his son Charles were convicted at Paris of misappropriation of the funds of the company and were sentenced to fine and imprisonment; the sentence, however, was never executed. That they were technically guilty, however, seemed clear, but it was also established that they were innocent of the intent to defraud.

Bibliography. A record of De Lesseps's many activities will be found in his own *Suez Canal: Letters and Documents Descriptive of its Rise and Progress* (London, 1876); id., *Recollections of Forty Years* (2 vols., ib., 1887); id., *The Isthmus of Suez Question* (ib., 1855); Bunau-Varilla, *Panama: The Creation, Destruction, and Resurrection* (ib., 1914); W. L. Pepperman, *Who Built the Panama Canal?* (New York, 1915). For biographies of De Lesseps, consult Bertrand and Ferrier, *Ferdinand de Lesseps* (Paris, 1887), and Smith, *Life and Enterprises of Ferdinand de Lesseps* (2d ed., London, 1895). See Suez Canal; Panama Canal.

LESSER BRETHREN. See Franciscans.

LESSER CEL'ANDINE. A plant related to buttercup. See Ranunculus.

LES'SING, Gotthold Ephraim (1729–81). A German critic and dramatist, born at Kamenz, Jan. 22, 1729; one of the earliest of the great German classical writers. His father, pastor at Kamenz, gave him his early instruction and sent him to a famous school at Meissen, where he learned so rapidly that he was admitted at 17 to the University of Leipzig, where he studied theology, then medicine, and later philosophy and literature. Here his sturdy nature almost immediately asserted itself against the smug platitudes of the Leipzig critics. "I realized," he wrote at this time, "that books might make me learned, but would never make me a man. I sought society to learn life." He took lessons in dancing, fencing, and riding. He translated French plays for the theatrical troupe of Frau Neuber, in whose theatre he learned much of stage technique, and in 1748 she put on his first play, *Der junge Gelehrte.* His early comedies include also *Die Juden*, *Der Misogyn*, *Die alte Jungfer*, and *Der Freigeist*, all more or less under French influence. Soon afterward (1748) he left Leipzig for the University of Wittenberg, whence after a short stay he followed his friend Mylius to Berlin, then as now the centre of German free thought. Here he lived by his pen, writing keen literary criticism and hack translations and venturing on original dramas and lyrics of no great value.

Here, also, Lessing met Voltaire, for whom he worked; but they soon quarreled, for Lessing betrayed a literary confidence of Voltaire's. Critically Lessing profited greatly by the acute Frenchman. He became acquainted with Friedrich Nicolai, Moses Mendelssohn, Karl Ramler, and others, with whom he pursued philosophical and literary studies. Meantime he had taken his master's degree at the University of Wittenberg. In 1754 appeared his *Vademecum für Herrn Samuel Gotthold Lange*, a sharp criticism of Lange's translation of Horace and in general of mediocre literature. In 1755 there appeared in Berlin a collection of Lessing's works in six volumes, containing among other things his new tragedy written under the influence of the English novelist Richardson and the dramatist Lillo, *Miss Sara Sampson*, epoch-making for the German stage as the first bourgeois tragedy.

In the same year Lessing went back to Leipzig. He had started on a three years' period of travel through the Netherlands, England, France, and Italy, as the companion of a wealthy man, when he was recalled at Amsterdam by the disturbances of the Seven Years' War, at a moment when Frederick's deeds were giving to lyric poetry a popular turn, which was welcomed by Lessing in his preface to the *Lieder eines preussischen Grenadiers* of Gleim (q.v.). He went to Leipzig, associated with E. von Kleist, planned *Emilia Galotti*, *Kleonnis*, and a *Faust*, and returned to Berlin in 1758. There he began to issue *Litterarische Briefe*, which cleared the air of choking mawkishness and false formality. With these *Letters* one phase of the classical period of German literature begins and on distinctively national lines. The *Letters* are among the oldest German works generally read to-day, and make Lessing "the Father of German criticism." To this period belong also his three books of fables, his prose tragedy *Philotas*, and his edition of Logau's epigrams.

The *Letters* were continued till 1765, irregularly, amounting finally to 24 volumes. In 1760 Lessing went to the seat of war in Silesia as secretary of General Tauenzien and gathered there materials for the greatest drama and the greatest work of æsthetic criticism that Germany had yet seen, *Minna von Barnhelm* (1767) and *Laokoon* (1766). *Minna von Barnhelm* was the first national drama of Germany; its personages were Germans of the day, drawn from Lessing's Silesian experience, and all of them true to the soil. In every literary field its health-giving influence was felt.

The *Laokoon* attempts to define the demarcation and the limits of poetry and painting. Only the first book was ever written, yet that gradually revolutionized literary taste in Germany. "That long-misunderstood phrase, *Ut pictura poësis*, was set aside. The distinction between the speaking and the plastic arts was clear. All the results of this glorious thought were revealed to us as by a lightning flash," said Goethe. Lessing hastened the publication of the *Laokoon*, hoping to win by it the post of royal librarian at Berlin; but Voltaire had prejudiced the King, and he appointed a third-rate French official to the post. Lessing, however, was called to Hamburg to be critic and adviser of the National Theatre there. Having sold his library to pay debts and rent, with his *Laokoon* unfinished, Lessing left Berlin in April, 1767.

In May, 1767, Lessing began to publish twice weekly the theatrical criticisms (52 in number) known as the *Hamburgische Dramaturgie*. These criticisms soon came to be true essays on dramatic art. The *Dramaturgie* may be regarded as a continuation of the *Laokoon*, and to this day remains the vade mecum of the German stage. It gave the deathblow to French imitation and pointed the way to Schiller and Goethe. In November, 1768, the National Theatre had to close, and Lessing went into the publishing business with Bode.

In 1769 Lessing suspended the *Dramaturgie*, which pirated reprints had made unprofitable, and was attracted to antiquarian studies by the ill-natured attacks of Professor Klotz, of Halle, against whose journal Lessing openly declared war in the *Antiquarische Briefe*. One of the last papers growing out of this campaign was the important essay *How the Ancients Represented Death*.

Famous, but poor, Lessing left Hamburg and in the spring of 1770 became court librarian of the Duke of Brunswick at Wolfenbüttel. He was now eager to found a home, for he had fallen deeply in love with Eva König, widow of a friend who had been a silk manufacturer in Hamburg. In 1775 he visited her at Vienna, where he was welcomed as no German author had ever been. He was recalled thence to accompany the Duke's son to Italy and found that his fame had gone before. In February, 1776, he returned and in October married his betrothed. She and her infant son died in January, 1778. During these years he had completed a remarkable prose tragedy, *Emilia Galotti* (1772). The story is that of Virginia, made familiar by Macaulay's "Lay"; the scene is ostensibly modern Italian, and, though Lessing seems to have avoided all definite political significance, the general application was so obvious that the court of Gotha forbade the representation. Lessing's work as a reformer of the German stage ends here. His *Nathan der Weise* (1779), though still acted, is rather a philosophical work in dramatic form, uniting his ethical and æsthetic studies to the theological controversies that were to fill his later years.

After the death of his wife and son, Lessing sadly yet bravely plunged into three years of intense controversial activity. Of this controversy the immediate cause was Lessing's editing of some posthumous essays by a Hamburg friend, Reimarus, a freethinker, which Lessing was not, though he was an unflinching believer in free speech, in the higher criticism of Scripture, and in the development of doctrine, as he showed in *Die Erziehung des Menschengeschlechts* (1780), a rather brief essay in 100 short numbered paragraphs. He thought and said that it was better error should be taught than freedom of thought stifled, and, further, that "the letter is not the spirit and the Bible is not religion." All these were novel ideas in that generation and peculiarly hateful to Pastor Goeze, of Hamburg, who led a numerous band of obscurantists, while at first Lessing was almost the only defender of free discussion. Lessing's letters in this controversy are remarkable for their eloquence, wit, satiric power, and dramatic vivacity. They mark a distinct advance in German prose style and a permanent gain to the religious life of the German nation. And out of the bitterness of the dispute came as a sweet fruit the dispassionate expression of its results in the dramatic poem of toleration, *Nathan the Wise*, inspired partly by his friendship for Moses Mendelssohn.

The same lofty theme of toleration was pursued during Lessing's closing years in *Die Erziehung des Menschengeschlechts*, the work on education cited above; and its principles appear in the political sphere in *Ernst und Falk, Gespräche für Friemaurer* (1778), whose bold utterance was muzzled by the Brunswick censor. Lessing in these last days wrote as one to whom hard experience had taught its lesson of self-denying wisdom. His mind was still active and eager, but his body was gradually giving way. On a visit to Brunswick he suffered a stroke of apoplexy, and died Feb. 15, 1781.

Lessing, says Goethe, was great by character and tenacity of will. By his plays he gave Germany a national drama; by his criticism, the field of his highest power, he established for his nation true canons of æsthetic and dramatic criticism, freed her from a petrified orthodoxy, and taught her to breathe a more tolerant and loftier Christianity. He himself offered the example of a life devoted to the search for truth.

Lessing's *Works* have been often collected, notably by Lachmann (13 vols., 1838–40; 3d ed., by Muncker, in 22 vols., Stuttgart-Leipzig, 1886–1910). Most of them are published separately. There are translations of the *Laokoon, Minna von Barnhelm, Emilia Galotti, Nathan der Weise,* and many others of his important works in all of the civilized languages.

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LES′SING, Karl Friedrich (1808–80). A German historical and landscape painter, grandnephew of Gotthold Ephraim Lessing. He was born near Breslau, Feb. 15, 1808, and was a pupil of Dähling at the Berlin Academy. He first devoted himself to landscape and in 1826 obtained a prize with his "Cemetery in Ruins." He accompanied Schadow to Düsseldorf, where he continued his studies, devoting himself to historical paintings. In 1830, when Schadow went to Italy, Lessing occupied his place as director of the academy, exercising great influence upon the Düsseldorf school. His picture "Das trauernde Königspaar" (Mourning Royal Couple) brought him great popularity. In 1837 he received a gold medal at Paris; he was a member of the Berlin Academy and was the recipient of several orders. In 1858 he was appointed director of the gallery at Karlsruhe, where he continued his activity as a painter until his death, Jan. 4, 1880. His work, like that of the Düsseldorf school in general, was at first theatrical, but it gradually became more realistic and virile. His historical paintings were mostly executed in the service of Protestantism. The best known are: "Hussite Sermon" (1836) and the "Martyrdom of Huss" (1850), in the National Gallery at Berlin; "Huss before the Council of Constance" (1842), in the Museum of Frankfort; "Dispute between Luther and Dr. Eck" (1867), in the Gallery of Karlsruhe; "Luther Burning the Pope's Bull" (1853); "Pope Paschal II, a Prisoner of Henry V" (1857), in the possession of the German Emperor. He is also represented in the galleries of Dresden, Leipzig, Cincinnati, and other cities. As a landscape painter, Lessing occupies an important place, being the chief master of the Romantic school in Germany. His landscapes were chiefly wild and solemn mountain scenery, preferably effects of storm or moonlight, painted directly from nature, only the figures being reminiscent of romanticism. Consult Wilhelm Jordan, *Ausstellung der Werke Karl Friedrich Lessings* (Berlin, 1880).

LES′SON (OF., Fr. *leçon,* It. *lezione,* from Lat. *lectio,* reading, lesson, from *legere,* to read, Gk. *λέγειν, legein,* to say). In the liturgical sense, a portion of the Church service appointed to be read, chiefly with a view to instruction and exhortation, as distinguished from prayer and praise addressed to God. In this sense it includes the epistle and gospel (qq.v.), but the term is more commonly applied to the selections read in the ancient breviary office of matins and in the morning and evening prayer of the Anglican churches. The earliest notices we have of services of the first Christians describe them as maintaining this practice and reading from the Old Testament Scriptures. Later, selections from Christian writings were introduced, including the letters of various bishops, especially those of St. Clement and the *Shepherd* of Hermas. Other edifying writings were read. When the canon of Scripture came to be definitely fixed, the reading during divine service was usually restricted to it. At first books were read continuously from beginning to end; but with the gradual development of the liturgical year selections were made in order to have the reading appropriate to the mystery or event commemorated. The arrangement of this order is commonly attributed to St. Jerome.

The lessons in the breviary (q.v.) for matins on Sundays and greater festivals are nine—the first three from Scripture, the next three usually from the lives of the saints or some historical matter, and the last from a homily of one of the fathers on the gospel for the day. On smaller festivals and ordinary week days only three are read. Some monastic rites have four lessons in each nocturn. In the Anglican Prayer Book two lessons, much longer than those in the breviary and of course in English, are appointed for morning and for evening prayer on each Sunday, festival, or week day; the first is always taken from the Old Testament, and the second from the New.

LESSON, lå′sôɴ′, René Primevère (1794–1849). A French naturalist, born at Rochefort. He was largely self-educated, save for a medical course at Rochefort which fitted him for ship's surgeon, and was on board the *Regulus* when it was burned at Bordeaux by the British. He was director of the botanical gardens at Rochefort in 1822, when he was ordered on board the *Coquille* for her famous voyage around the world. After his return he became professor of botany at Rochefort. With Garnot and Guérin he wrote *Voyage autour du monde sur la corvette La Coquille* (1830), and alone published supplements to Buffon (1828, 1835–41), a popular description of the cruise of *La Coquille* (1838), and many works on zoölogy and natural history, especially as relating to medicine.

LESSON IN ANATOMY, or School of Anatomy, The (q.v.). A celebrated painting by Rembrandt.

LES′TER, Charles Edwards (1815–90). An American author, born at Griswold, Conn., a descendant of Jonathan Edwards. He was of a roving disposition and traveled widely in the United States and Europe. He was admitted to the bar in Mississippi and later was ordained a minister in the Presbyterian church. In 1840 he addressed antislavery meetings in Massachusetts and was elected a delegate to the London antislavery conference of that year. He did not return to the United States after the close of the conference, but remained in England. His *The Glory and Shame of England*, published in New York in 1841, criticized England's antislavery professions. In 1842 President Tyler appointed Lester United States Consul at Genoa. He wrote: *The Life of Vespucius* (1845; new ed., 1905); *The Artist, the Merchant, and the Statesman of the Age of the Medici and of Our own Times* (2 vols., 1845); *My Consulship* (2 vols., 1851); *The Napoleon Dynasty* (1852); *America's Advancement, or the Progress of the United States during their First Century* (1878); *The Mexican Republic* (1878); and a *Life of Charles Sumner* (1874).

LES'TERSHIRE. A village in Broome Co., N. Y., on the Susquehanna River, 2 miles west of Binghamton, on the Erie and the Delaware, Lackawanna, and Western railroads (Map: New York, D 6). It has manufactories of boots and shoes, spools and bobbins, cameras, boxes, and furniture. There are also planing mills, etc. The village contains a hospital and owns its water works and sewage system. Pop., 1910, 3775.

LESTOCQ, *le*-stŏk', JEAN HERMANN (1692–1767). A French surgeon and adventurer. He became a surgeon and went to Russia (1713), where he received an appointment in the service of Peter the Great. In 1718, however, he was banished to Kazan on account of his dissolute habits. Recalled by Catharine I (1725), he was appointed surgeon to her daughter, Princess Elizabeth. Lestocq's great influence over Elizabeth was used to encourage her in effecting the revolution of 1741, by which she became Empress of Russia. (See ELIZABETH PETROVNA.) Although at first rewarded handsomely with various state positions, Lestocq, thanks to his enemies, came under suspicion for disloyalty (1748) and was arrested, tortured, and banished to Ustjuk Veliki in the Province of Archangel. He was recalled by Peter III in 1761, and Catharine II gave him a large annual pension and an estate in Livonia.

LESTRANGE, le-strānj', SIR ROGER (1616–1704). An English journalist and translator, born at Hunstanton, Norfolk, Dec. 17, 1616. He was probably educated at Cambridge. Being a zealous Royalist, he accompanied Charles I in his expedition against the Scotch in 1639. In 1644 he was appointed by the King Governor of Lynn, and he attempted to take it from the Parliamentary forces, but, betrayed by two of his accomplices, he was tried, doomed to death as a traitor, and sent to Newgate. After four years he escaped and tried to incite an insurrection in Kent, but, failing, he fled to the Continent. After the passage of the Act of Indemnity (1652) he returned to England (1653) and made personal application to Cromwell and was allowed to remain undisturbed. After the Restoration he was appointed by Charles II censor or licenser of the press. In the *Public Intelligencer*, a newspaper which he started in 1663, he slavishly supported the crown. The *Observator*, begun in 1681, two years after the Popish plot, as the organ of the Tory party, aimed to defend the King from the charge of favoring popery. In 1685 Lestrange was knighted by James II for "his unshaken loyalty to the crown" and elected to Parliament. In 1688 he was deprived of his office of censor and committed to prison for a short time. He died Dec. 11, 1704. In the history of journalism Lestrange occupied a considerable place. His political pamphlets, coarse and brutal in style, hit hard. Among his translations, which have often been praised, are the following: Josephus; Seneca's *Morals* (1693); Erasmus' *Colloquies* (1680); Æsop's *Fables* (1692); Quevedo's *Visions* (1667); Bona's *Guide to Eternity* (1680); *Five Love-Letters from a Nun to a Cavalier* (1678).

LESUEUR, le-sụ'ẽr', CHARLES ALEXANDRE (1778–1857). A French naturalist, born at Havre. He made his first success with his drawings illustrating the zoölogical discoveries of the expedition undertaken by the corvette *La Géographie* when she made her trip around the world (1800–04). With Péron, he published and illustrated valuable monographs on *Radiaires de la classe des méduses* and *Mollusques ptéropodes*. In 1815 he went to America with Maclaure and lived for some time in Philadelphia, where he contributed to the memoirs of the Academy of Natural Sciences. He returned to Havre in 1844 and became keeper of the city's museum.

LE SUEUR, DANIEL (the pseudonym of JEANNE LAPAUZE, née LOISEAU) (1860–1920). A French novelist and poet, who became one of the best known of women writers of her time. In 1904 she married Henry Lapauze, an art critic. Besides having her work crowned by the French Academy, she was awarded the Vitet and other prizes and was appointed Knight of the Legion of Honor. A prolific writer, in later years she published at least one and sometimes two novels annually. Haste and resulting lack of polish characterize this later work. She began with a volume of poems, *Fleurs d'avril* (1882), and wrote also somewhat of country life. Her *L'Evolution féminine* (1905) was written at the request of the Congress of Industry and Commerce of the 1900 Paris Exposition. Among her other works are: *Amour d'aujourd'hui* (1888); *Un mystérieux amour* (1892); *A force d'aimer* (1895); *Invincible charme* (1897); *Au delà de l'amour* (1899); *L'Honneur d'une femme* (1901); *La force du passé* (1905); *Une âme de vingt ans* (1911); *Au tournant des jours* (1912). She also wrote dramas—*Manque d'amour* was played at the Théâtre Sarah Bernhardt.

LE SUEUR, EUSTACHE (1617–55). A French historical painter. He was born in Paris and studied in the atelier of Simon Vouet, where Lebrun was his fellow pupil. One of his early works, "St. Paul Healing the Sick," was painted for the Academy of St. Luke. He was among the first members of the Académie Royale de Peinture et de Sculpture, established in 1648, and the only rival of Lebrun, its founder. During his early years Le Sueur was occupied with miscellaneous designing, but he soon achieved a reputation and was afterward employed constantly in decorative works for Anne of Austria's apartments in the Louvre, for private residences, and for churches. In 1645–48 he executed a series of 22 notable pictures from the life of St. Bruno for the Chartreuse monks in Paris. They are now in the Louvre. Another important work of Le Sueur's, also preserved in the Louvre, was a decoration in the Hôtel Lambert de Thorigny, with mythological subjects representing the "Life of Cupid" and "The Muses." From the purity and grace of his conceptions he was called the French Raphael. In the religious pictures painted by him for Paris churches (10 of which, including "St. Paul at Ephesus" and "The Mass of St. Martin of Tours" are in the Louvre), he shows genuine devotional feeling, but he is never a satisfactory colorist, and is lacking in power. In many of his works he was assisted by his brothers Pierre, Philippe, and Antoine, and his brother-in-law Goussé.

LESUEUR, Jean Baptiste Cicéron (1794–1883). A French architect, born at Clairefontaine (Seine-et-Oise). He was a pupil of Percier, studied at the Ecole des Beaux-Arts, and won the Prix de Rome in 1819. He became a member of the Institute in 1846 and professor at the Ecole in 1852. His principal work, in which he was associated with Godde, was the extension of the Hôtel de Ville of Paris in 1835–54. He also built the Conservatory of Music in Geneva, Switzerland. His publications on architecture include: *Vues des monuments antiques de Rome* (1827), with Alaux; *Architecture italienne ou palais, maisons et autres édifices de l'Italie moderne* (1829), with Callet; *Chronologie des rois d'Egypte* (1848–50), crowned by the Academy.

LE SUEUR, Jean François (1760–1837). A French composer, born at Drucat-Plessiel, near Abbeville. As a child, he was chorister at Abbeville and when 14 was sent to college at Amiens. In 1779 he left there to become music master at the Séez Cathedral and a little later went to Paris, where he was made assistant master at the church of the Innocents. While there he received from the Abbé Roze some musical instruction. In 1781 he accepted the post of music master at the cathedral of Dijon and from there went to Le Mans (1783) and subsequently to Tours. In 1784 he returned to Paris and two years later won in competition the musical directorship of Notre Dame. He inaugurated radical reforms, using a large orchestra and even preluding a mass with an overture. His methods, although popular, aroused bitter opposition, and in 1788 he retired for four years to the country, where he devoted himself to composition. In 1793 he produced in Paris an opera, *La Caverne,* followed the next year by *Paul et Virginie* and *Télémaque.* He was appointed inspector at the Conservatory (1795), but in 1802 lost his position owing to a bitter altercation over the rejection by the Grand Opéra of two of his operas. In 1804 he obtained the highest musical honor in France, being chosen Paisiello's successor as maître de chapelle to Napoleon. His two rejected operas, *Les bardes* and *La mort d'Adam,* were now produced; he succeeded Grétry at the Institute (1813); became superintendent and composer of the chapel of King Louis XVIII and in 1818 professor of composition at the Conservatory. He died in Paris. Le Sueur was a brilliant teacher, and 12 of his pupils (Berlioz was one) won the Prix de Rome. As a composer, he ranked high, his principal characteristics being a grand simplicity and marvelous harmonic skill. He is the earliest exponent of programme music in the modern sense of the term. His hobby was ancient Greek music, and he wrote *Notice sur la mélopée, la rhythmopée et les grands caractères de la musique ancienne* (Paris, 1793). With the exception of the operas already mentioned, his compositions were almost wholly sacred and include the oratorios *Déborah, Rachel, Ruth et Noémi, Ruth et Boaz,* three *Te Deums, Stabat Mater,* masses, etc. Consult Stephen de la Madeleine, *Biographie de J. F. Le Sueur* (Paris, 1841), and Fouqué, *Le Sueur comme prédecesseur de Berlioz* (ib., 1882).

LE SUEUR, William Dawson (1840–1917). A Canadian journalist and author. He was born in Quebec and was educated at the Montreal High School, the Ontario Law School, and Toronto University. In 1856 he entered the Canadian civil service in the Post Office Department, being secretary thereof from 1888 to his retirement in 1902. He was honorary secretary of the Royal Society of Canada (1908–11), vice president of the Peace and Arbitration Society, and vice president of the Canadian Society of Authors. For many years he was an editorial contributor to the Montreal *Gazette,* later to the Montreal *Star,* and also to the leading magazines and reviews of the United States and Canada. He published: *Ste. Beuve; A Defense of Modern Thought; Evolution and the Positive Aspects of Modern Thought; The Poetry of Matthew Arnold; Notes on the Study of Language; The Development of Responsible Government in Canada; The Life of Frontenac* (1906), in the "Makers of Canada Series."

LESZCZYNSKI, lĕsh-chĭn'skė, Stanislas. See Stanislas I Leszczynski.

LETAROUILLY, le-tȧ'ro͞o'yē', Paul Marie (1795–1855). A French architect, born at Coutances. In 1814 he entered the atelier of Charles Percier in Paris and in 1819 entered the Ecole des Beaux-Arts. He spent some time in Italy, then became inspector of construction under the Ministry of Finance, and was chief architect of the Collège de France. He is known chiefly for his *Edifices de Rome moderne* (text, 1 vol., 1868; plates, 3 vols., 1868–74) and *Le Vatican et la basilique de Saint Pierre* (plates, 3 vols., 1882).

L'ÉTAT C'EST MOI, lå'tȧ' så mwä (Fr., I am the state). An expression put into the mouth of Louis XIV and intended to epitomize that monarch's system of absolutism. Various origins are assigned for the phrase. Louis is said to have uttered it in the Parliament of Paris, in 1655, in response to a statement of the President, when he was asked to convoke the States-General, or to a judge who used the words "King and state."

LETCH'ER, John (1813–84). An American politician, Governor of Virginia during the Civil War. He was born in Lexington, Va., was educated at Washington and Randolph-Macon colleges, was admitted to the bar, and began to practice in Lexington, Va., in 1839. In 1850 he was elected a delegate to the Virginia Constitutional Convention and afterward (1851–59) sat in Congress during the stormy times preceding the outbreak of the Civil War. He was Governor of Virginia in 1860–64 and opposed the secession ordinance, but, seeing the hopelessness of maintaining that attitude, turned over the State militia and munitions of war to the Confederate leaders. After the war he was a member of the State Legislature in 1876–77.

LETELLIER DE SAINT JUST, le-tĕl'yā' de säɴ' zhụst, Luc (1820–81). A Canadian statesman. He was born at Rivière Ouelle, Province of Quebec, and was educated to be a notary. Entering politics, in 1851 he was elected a Liberal member of the Canada Legislative Assembly, in 1860 was elected to the Legislative Council, in 1863–64 was Minister of Agriculture in the Macdonald-Dorion administration, and after Confederation was called to the Dominion Senate (1867). He was Minister of Agriculture (1873–76) in the administration of Alexander Mackenzie (q.v.) and in 1876 was appointed Lieutenant Governor of Quebec. His tenure of that office was made notable by the dismissal of the De Boucherville ministry; in 1879 Letellier de St. Just was himself dismissed by the Governor-General-in-Council. (See QUEBEC, *History.*) He died two years later.

LETH'BRIDGE. A city and the capital of Medicine Hat District, Alberta, Canada, on the Canadian Pacific Railway and on the Belly River, 144 miles by rail southeast of Calgary and about 700 miles west by south (direct) of Winnipeg (Map: Alberta, H 9). Among its public buildings and institutions are the courthouse, the customs, land, inland-revenue, and immigration offices, post office, manual-training school, and Y. M. C. A. building. Lethbridge is one of the posts of the Royal Northwest Mounted Police. It is the centre of an irrigation belt of 125,000 acres and the distributing point of southern Alberta and the southeastern British Columbia mining and lumbering districts. In 1915 there were five large coal mines, employing 2000 persons, with a daily capacity of 4000 tons. Its manufacturing establishments include iron foundries and machine shops, brickyards, sash and door factories, flour mills, cigar factories, and a brewery. It is the seat of a Dominion Experimental Farm. The surrounding district is well adapted for mixed farming. The city owns its electric-lighting plant and water works. Pop., 1901, 2072; 1911, 8050; 1915 (local est.), 11,070.

LETHE, lē'thē (Lat., from Gk. Λήθη). The stream of oblivion in the lower world, from which, according to the ancient Greek belief, the souls of the departed drank, to lose all recollection of earthly existence, before passing into the Elysian Fields (q.v.).

LETH'INGTON, LORD. See MAITLAND, SIR RICHARD.

LE'TO. See LATONA.

LETRONNE, le-trôn', JEAN ANTOINE (1787–1848). A French archæologist and historian. He was born and was educated in Paris; traveled in France, Italy, Switzerland, and Holland (1810–12); and for his *Essai sur la topographie de Syracuse* (1813), intended to throw light on the account given by Thucydides (q.v.) of the Athenian attack on Syracuse, and *Recherches sur les fragments d'Héron d'Alexandrie* (written in 1816 and printed 1851), was elected to the Academy of Inscriptions. He became professor of history in the Collège de France in 1831, head of the Royal Library in the same year, professor of archæology at the Collège de France in 1838, and in 1840 inspector general of the national archives. His most important work was *Recueil des inscriptions grecques et latines de l'Egypte* (2 vols., 1842–48, completed by Brunet de Presle). His other works on archæology, especially inscriptions and numismatics, include: *La peinture murale chez les Grecs et les Romains* (1835–37); *Considérations générales sur l'évaluation des monnaies grecques et romaines, etc.* (1817); *Recherches pour servir à l'histoire d'Egypte pendant la domination des Grecs et des Romains* (1823); *Fragments de Scymnus de Chio et du faux Dicéarque* (1840); and, on history, *Matériaux pour servir à l'histoire du christianisme* (1833). Consult J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

LETTE, lĕ'te, WILHELM ADOLF (1799–1868). A Prussian politician and economic reformer, born in Kienitz. He studied law and philosophy at the universities of Heidelberg, Göttingen, and Berlin. Participation in "demagogic" disturbances resulted in his imprisonment and exclusion from state employ, but neither was of long duration. In 1835 he was connected with the Court of Appeals at Posen, in 1840 was made director of the Prussian Agricultural Bureau at Frankfort-on-the-Oder, and three years later received the appointment of counselor to the Ministry of Interior for agricultural matters. In 1845 he became president of the Court of Errors for agricultural affairs. His interest in the welfare of the people was shown by his establishing many associations; e.g., the Centralverein für das Wohl der arbeitenden Classen and the Berliner Handwerkerverein. In 1848 he was a member of the Constitutional party. In 1851 he was a member of the first Prussian Chamber and a year afterward took a seat in the other House, which he kept until his death. His more important writings are *Die Landeskulturgesetzgebung des preussischen Staats*, with Rönne (1853–54), and *Die Verteilung des Grundeigentums im zusammenhang mit der Geschichte, der Gesetzgebung und den Volkszuständen* (1858).

LETTENHOVE. See KERVYN DE LETTENHOVE.

LETTER (OF., Fr. *lettre*, from Lat. *littera*, *litera*, letter). In law, an authoritative writing empowering the person to whom it is issued to exercise a certain office, perform a duty, or do any other act which, but for such authorization, could not have been lawfully performed. Letters are issued for many purposes and under a great variety of circumstances. A *letter of attorney*, or power of attorney, is a writing or deed authorizing a person to do any lawful act, as to receive and receipt for money, execute a deed or contract, in the stead of the party executing it. *Letter of exculpation*, in Scots criminal law, is a warrant obtained by a prisoner to summon witnesses on his behalf at his trial. *Letter missive*, in England, is an order from the Lord Chancellor to a peer requesting the latter to enter an appearance to a bill filed in chancery against such peer; in Scotland the word means any written agreement or memorandum relative to some bargain as to mercantile matters, or as to the sale of land or houses or the letting of land. *Letter of request*, in English ecclesiastical law, signifies a writ by which a suit against a clergyman is instituted in the Court of Arches, instead of proceeding, in the first instance, in the consistory court. *Letter of safe-conduct* means a writ, under the great seal, to the subject of a state at war with any country, authorizing and protecting such subject, while dealing or traveling in that country, so that neither he nor his goods may be seized, as they otherwise might be. *Letters testamentary* is an instrument issued by a judge who has jurisdiction of probate matters, declaring that a certain will has been admitted to probate and giving the executor power to administer the estate. Such an instrument granted to the administrator of a person dying intestate is called *letters of administration.* See Letters Patent; Letters Rogatory; Credit, Letter of; Administration; Executor; Attorney, Power of.

LETTER CARRIERS, National Association of. An association organized at Milwaukee in 1899 and subsequently incorporated under the laws of Tennessee, with the object of uniting all the letter carriers of the United States in a fraternal society and establishing the Letter Carriers' Mutual Benefit Association and the Letter Carriers' Retirement Association. Its enrolled membership in 1915 was 32,851, out of a total of 36,000 city letter carriers in the United States. There is a similar and separate organization for rural postal carriers. The Mutual Benefit Association, paying insurance benefits, and the Retirement Association, providing for annuities and weekly disability benefits, are subsidiary societies to the National Association. The number of members holding certificates in the Mutual Benefit Association was (Sept. 1, 1914) 6999. The official organ is *The Postal Record,* published at Washington, D. C. The organization has been active politically in securing more favorable working conditions for postal carriers and clerks, in removing the paid service from the influence of party politics, and in agitating for a national pension for superannuated carriers.

LETTER OF ATTORNEY. See Attorney.

LETTER OF CREDIT. See Credit, Letter of.

LETTERS. The characters of written speech. Letters are therefore the components of the alphabet (q.v.). They are quite inadequate to represent the sounds for which they stand, although there have been repeated attempts to make a system of letters which would answer the requirements of phonetics (q.v.). In these so-called phonetic alphabets, as well as in the transcription of alphabets which differ in a marked degree from the Roman script, as Russian, Armenian, Hebrew, Chinese, and many others, it is both customary and necessary to associate various diacritical marks with the Roman letters to approximate their phonetic value in the foreign alphabets in question.

LETTERS, Proportionate Use of. The following tables represent the conclusions based on the experience of printers, with regard to the relative frequency of use of the letters of the alphabet in English composition. The first table exhibits the general use:

E	1,000	M	272
T	770	F	236
A	728	W	190
I	704	Y	184
S	680	P	168
O	672	G	168
N	670	V	158
H	540	B	120
R	528	K	88
D	392	J	55
L	360	Q	50
U	296	X	46
C	280	Z	22

The proportion of their use as initial letters is as follows:

S	1,194	M	430
C	937	F	388
P	804	I	377
A	574	E	340
T	571	H	308
D	505	L	298
B	463	R	291
W	282	J	69
G	266	Q	58
U	228	K	47
O	206	Y	23
V	172	Z	18
N	153	X	4

LETTERS IN LITERATURE. The letter belongs to the most personal branches of literature, represented also by the journal and the confession. For Greek letter writing, see Papyrus Letters.

Of the Roman letters that have survived from antiquity, those of Cicero to Atticus and other friends make the widest appeal. Covering, as they do, the great civil war between Pompey and Cæsar, they are precious historical documents. Cicero himself is always present in his hopes and perplexities; and withal there is a sane reflection on conduct and the course of public affairs. It is perhaps not too much to say that the letter as a literary species, with its own style and form, dates from Cicero. After Cicero the next most notable collection, in order of time, is the series of 124 letters from Seneca to Lucilius. Seneca's letters are, however, rather moral observations and aphorisms put into epistolary form. The letters of the younger Pliny likewise rank high as literature. Besides details in the life of the rich and genial author, they also contain interesting facts concerning the treatment of Christians. Among later Roman letter writers whose work has great historical if not literary interest, were Symmachus and Cassiodorus. From the Romans comes, too, the verse epistle, in which the poet addresses his patron or friend on private or public events, often with a satirical intent. Of this art Horace was the ancient master.

The early fathers of the Church left a large body of theological correspondence. Particularly prized are the letters of Gregory Nazianzen, Basil, Chrysostom, Ambrose, Augustine, Jerome, Zosimus, Leo I, and Gregory I. In the letters of Héloïse to Abélard (twelfth century) there was displayed an intense love passion, the counterpart in real life of the great romance of *Tristan and Iseult.* All through the Renaissance period, when classical ideals played havoc with mediæval notions, letters in Latin were numerous. For Italy there are the famous epistles of Dante and Petrarch; and for Germany, the theological and controversial epistles of Reuchlin, Melanchthon, Erasmus, and Pipsius. A most remarkable collection is the *Epistolæ Obscurorum Virorum* (2 parts, 1515–17), in which Reuchlin's friends Crotus Rubianus and Ulrich von Hutten satirized in comic Latin the ignorance and stupidity of the monks. Though not a very noble defense of classical learning, this vulgar satire was effective in paving the way to a new age.

English literature is extremely rich in letters. At the very threshold of modern times are the *Paston Letters,* which passed between members of a Norfolk family and their friends from the beginning of the reign of Henry VI on into the reign of Henry VII. The correspondence presents a vivid picture of social life at the dawn of the English Renaissance. The Eton boy writes to his "right and reverent and worshipful brother" for money and clothes; and mingled with public and private incidents detailed by the elders are references to Latin manuscripts and translations passing from hand to hand. Less sincere, but of finer literary quality, are the letters of James Howell, published in installments under the title *Epistolæ Ho-elianæ; Familiar Letters* (1645–47–50–55). The best of them, abounding in shrewd observation and humorous anecdote, are written with a graceful pen. Long considered genuine, it now seems that they were mostly literary exercises put into epistolary form. Howell's success led at once to fictitious collections by Robert Loveday and Margaret, Duchess of Newcastle. By 1740 imaginary letters on a great variety of topics were much sought by publishers. It was at this time that Samuel Richardson, when asked to write such a collection, wove into the correspondence the story *Pamela* and thus transformed a bundle of letters into the novel of manners.

In the meantime letters were passing between real men and women. The correspondence between Sir William Temple and Dorothy Osborne, his future wife, records a tender attachment and has a glow and charm of sentiment that should entitle it to a wider vogue than it has ever found. A little later, Temple's amanuensis, afterward Dean Swift, was sending his charming prattle to Stella; but her letters in reply were destroyed by the great Dean. Swift also kept up a correspondence with Arbuthnot, Bolingbroke, and Pope, and wrote those "masterpieces of dreadful humor" called the *Drapier's Letters*. Pope's own correspondence with his friends, presenting the poet as he wished to appear to the world, is a good example of an autobiography in letter form. One of Pope's correspondents was Lady Mary Wortley Montagu, whose letters, covering nearly 50 years, were published after her death. As vivacious comments upon contemporary life, social and literary, they are among the best that have ever come from women. Individual letters of Dr. Johnson, as the repudiation of Lord Chesterfield, are celebrated. Chesterfield's letters to his natural son, forming a cyclopædia of polite manners, created a great stir in their time and are still read for their natural grace and good breeding. In the *Citizen of the World* Goldsmith turned an imaginary correspondence into a light satire of contemporary manners. Many imitators followed down to the time of Robert Southey. The political satire in letter form attained its greatest popularity in the *Letters of Junius* (q.v.). The finest personal letters of the eighteenth century came from Walpole, who wrote with abandon, giving loose rein to anecdote, gossip, scandal, and playful cynicism. Gray's letters, tender, affectionate, and lit here and there with gleams of exquisite humor, are perfect in tone and temper. In style Cowper stands midway. His letters, written without revision or erasure, are the spontaneous expression of a tender and humorous nature softened by melancholy. Among other names of the eighteenth century that should not be forgotten are Addison, Sterne, Frances Burney, Mary Wollstonecraft, Hannah More, and Burns.

During the last century the literature of letters became vast. The death of any author of repute is now sure to be followed by the publication of his correspondence, which serves as an autobiography for the whole or a part of his career. Particularly interesting was the fairly successful attempt to tell the story of George Eliot's life by a chronological arrangement of her letters with slight connecting links from the pen of her husband. Of genuine letters addressed from friend to friend, the choicest since Cowper are by Byron and Charles Lamb. The letters of Edward FitzGerald, addressed to some of the most eminent men of his time, are also models of ease and frankness. Public curiosity has led to the publication of the love letters of literary men. The two most notable examples are the letters of Keats to Fanny Brawne and the correspondence between Browning and Miss Barrett just before their marriage. Great interest also attaches to the correspondence of Scott, Southey, De Quincey, Leigh Hunt, Sydney Smith, Lockhart Hood, Macaulay, Emerson, Carlyle, Mrs. Carlyle, Thackeray, Ruskin, Matthew Arnold, Stevenson, Lowell, and T. E. Brown.

It has generally been conceded that the French excel all other nations in the art of letter writing. And certainly, if one were called upon to select the most charming letter writer of modern times, the lot would fall to Madame de Sévigné, a member of the celebrated Hôtel de Rambouillet. She was a part of the best Parisian society for more than 40 years. Her daughter married the Count de Grignan and settled in Provence. This separation was the occasion of the famous correspondence, never intended for publication, describing with extraordinary art and *esprit* the life of the capital. To the same period belong the letters of Madame de Maintenon, Guy Patin, and Racine. The theological letter received its highest style from Pascal in the *Lettres à un provincial*. For the eighteenth century may be cited Madame du Deffand; Voltaire, who left many volumes of correspondence, including letters from England and letters to Frederick the Great; and Rousseau, who, besides numerous letters to his friends, wrote a novel in letter form. The classic traditions of the French letter were continued by Madame de Staël, Hugo, Sainte-Beuve, George Sand, Alfred de Musset, the Goncourts, and Prosper Mérimée, whose intimate *Lettres à une inconnue* appeared after his death.

German letters do not impress a foreigner with those prime requisites to a good letter—ease and grace. On the other hand, the German usually has something worth saying. Best known outside of Germany are the letters of Luther to his friends and family, the correspondence between Goethe and Schiller, and the letters of Bismarck to his wife. No letters equal those between Goethe and Schiller for letting one into the secrets of great authorship. Each informs the other of what he is doing and, so far as he can, describes the method of procedure. Schiller's letters to Körner treat in part the same theme. Among other Germans who have left valuable letters are Lessing, Herder, Winckelmann, the brothers Humboldt, Richter, the Schlegels, Heine, the Grimms, and Richard Wagner.

Bibliography. Roberts, *History of Letter-Writing from the Earliest Period to the Fifth Century* (London, 1843); Holcombe, *Literature in Letters* (New York, 1866); Knight, *Half-Hours with the Best Letter-Writers* (London, 1867); some interesting comments on ancient Egyptian letter writing on papyrus in W. Pleyte, *L'Epistolographie égyptienne* (Leyden, 1869); Scoones, *Four Centuries of English Letters* (ib., 1880); *Great English Letter-Writers* (2 vols., New York, 1909), edited by W. J. and C. W. Dawson, an excellent anthology of English letters, introduced by a study of the development of English letter writing.

LETTERS OF JUNIUS. See JUNIUS, LETTERS OF.

LETTERS OF MARQUE. See MARQUE, LETTERS OF.

LETTERS PATENT. An open letter under the seal of the government granting some property, right, privilege, or title. It is in form an open letter addressed to the public and intended to be evidence of the rights of its grantee. The term is usually now applied to (*a*) an instrument issued from the Patent Office in the name of the government, granting and confirming to an inventor the exclusive right and privilege to his invention; (*b*) less specifically, an instrument by which lands are granted by the government to individuals. See PATENT; PATENT LAW.

LETTERS ROGATORY. A written instrument addressed by one court to another in a foreign jurisdiction, requesting the latter to cause to be examined, upon written interrogatories annexed, a witness who is within the jurisdiction of the latter court. Letters rogatory are designed to accomplish the same purpose as a commission to take depositions. Letters rogatory are sent to foreign countries, as there is no "comity of states" to rely on in such cases, and are quite common, especially in Admiralty proceedings. See DEPOSITION.

LETTERS TO DEAD AUTHORS. A series of critical essays by Andrew Lang (1886).

LET′TERWOOD, or SNAKEWOOD. The heartwood of a rather rare British Guiana tree, *Brosimum aubletti*, of the family Moraceæ. It grows from 60 to 70 feet high and acquires a diameter of from 2 to 3 feet. The sapwood is white and hard; the harder and heavier heartwood, which rarely exceeds 7 inches in thickness, is a rich brown, beautifully mottled with deeper shades of brown, almost black, spots, arranged with much greater regularity than is usually the case in the markings of wood and bearing a slight resemblance to the thick letters of some old black-letter printing. In Guiana it is used for small articles of cabinetwork and elsewhere only for fine veneer and inlaying work.

LET′TIC LANGUAGE AND LITERATURE. The language and literature of the Letts (q.v.), living in the Russian Province of Courland, Livonia, Vitebsk, Kovno, and Pskov, and in East Prussia and in the United States and Brazil. The number of Lettic-speaking people is estimated at 2,000,000. With Lithuanian (q.v.) and Old Prussian (q.v.), Lettic forms the Baltic subdivision of the Indo-Germanic languages (q.v.). The mutual relation between Lettic and Lithuanian is approximately the same as between Old High German and Gothic. Only in a few points is Lettic the more archaic. It has preserved unchanged Indo-Germanic *s* and *z* where Lithuanian has modified them into *sz* (*sh*) and *ž*, and it retains the original short vowels where Lithuanian shows long vowels of later development. The imperative is identical with the second person indicative, while Lithuanian has developed a new form with *k* as the characteristic sign. On the other hand, Lettic has lost the pure *o* sound and has lost the nasal *n* (as, Lith. *rankà*, OChurch Slav. *rąka*, Lettic *ruka*, Russ. *růka*, hand; Lith. *linkti*, Lettic *likt*, to bend). Usually the vowels in final syllables are dropped (as, Lettic *růkás*, Lith. *rañkosu*, locative pl. of *rankà*, hand, Lettic *likt*, Lith. *linkti*, to bend). Morphologically Lettic, like the Romance languages, possesses only two genders, the neuter (in pronouns and adjectives) being replaced by the masculine. The dual has disappeared entirely, except in *diwi*, two, and *abbi*, both. Of the eight Indo-Germanic cases, the ablative is lost, and the nominative generally performs the functions of the vocative, while the instrumental is usually identical with the accusative in the singular and with the dative in the plural. The verb, which is divided into 12 classes, has only three simple tenses (present, preterite, and future) and three simple moods (indicative, conditional, and imperative), besides an infinitive stem and a supine in *tu*. It has an active and a reflexive, formed by adding *-s* = *sewi*, self, as well as a passive voice, and six participles, four active (two present, one preterite, and one future) and two passive (present and preterite). The number of periphrastic forms is extremely large. As in Czech, the accent came to be fixed invariably on the first syllable. In its vocabulary Lettic exhibits the influence of German, Russian, Esthonian, Livonian, Finnish, and Scandinavian, and three groups of dialects are distinguished: High Lettic, in the east; Low Lettic, or Tahmian, in northwestern Courland; and Middle Lettic, on which the literary language is based.

The earliest printed literary monuments in Lettic are a translation of Luther's *Catechism* (printed in Königsberg, 1586), *Undeutsche Psalmen*, and *Gesänge* (ib., 1587), a Lettic version of psalms and hymns. A Lettic Bible was printed at Riga (1685–89). A special alphabet based on the German was created by Manzelius (1593–1654). Nearly all the works up to the time of G. F. Stender (1714–96) were of a religious character. Stender compiled an exhaustive dictionary and wrote a grammar which marked an epoch in the history of Lettic. He also composed stories and tales, and a *Book of Wisdom Concerning the Universe and Nature* (*Augstas gudribas grahmata*, 1776), containing elements of astronomy, geography, and history, as well as odes and songs. His son Alexander (1744–1819) wrote the first Lettic comedy. The period 1750–1820 is marked by the birth of national consciousness. The educational efforts of the pastors J. C. Wolter (1799–1856) and Watson were largely instrumental in spreading among the hitherto neglected lower classes the elements of a national culture. To promote it further, periodicals were started, of which the *Latweeschu Awise*, founded by Watson in 1822, was the first, and the *Magazin*, the organ of the Lettic Literary Association of Mitau since 1827, has been the most important. The decades 1860–80 were the culminating years of this nationalism in literature, with Woldemar at the head of the "Young Lettic" group, mostly educated in Russian universities. They endeavored to rid themselves of the all-pervading German influences; they translated the European and Russian classics and published periodicals wherein the whole economic, social, and intellectual life of the Letts was discussed with a view to betterment. The last two decades of the nineteenth century were characterized by striving to gain independence from foreign ideals. The best authors of the period were Jur Allunan, a lyric poet and editor of the almanac *Home, Nature, and Universe;* Kroghen (pseud. Ausaklis); the brothers Kaudsit; the Nationalist Kronwald; Neikens; Pumpurs; the folklore collector Treuland-Brihwsemneeks; and the lyric poet Lautenbach (pseud. Jųsminis, professor at Dorpat). The best-known modern names are the poetess Rosenberg-Aspasia; Ap-sit; Blauman; Steperman, the author of historical dramas; the lyric poet Rainis-Pleekschau, author of an admirable translation of *Faust;* the critics Theodor, Janson, and Zeifert; and the fertile Martin Lap, a ballad writer and translator of great gifts. In 1896 the works existing in Lettic numbered 2027, besides 10 periodicals. The Lettic folk literature is enormous, especially in the line of proverbs, riddles, tales, legends, and songs (*dainas*).

Bibliography. Bielenstein, *Die lettische Sprache* (Berlin, 1863–64); id., *Lettische Grammatik* (Mitau, 1863); id., *Die Elemente der lettischen Sprache* (ib., 1866), popular in treatment; Ulmann and Brasche, *Lettisches Wörterbuch* (Riga, 1872–80); Bielenstein, *Tausend lettische Räthsel, übersetzt und erklärt* (Mittau, 1881); Bezzenberger, *Lettische Dialekt-Studien* (Göttingen, 1885); id., *Ueber die Sprache der preussischen Letten* (ib., 1888); Thomsen, *Beröringer melem de Finske og de Baltiske Sprog* (Copenhagen, 1890); Bielenstein, *Grenzen des lettischen Volksstammes und der lettischen Sprache* (St. Petersburg, 1892); Baron and Wissendorff, *Latwju dainas* (Lettic Folksongs, Mitau, 1894); Andreianov, *Lettische Volkslieder und Mythen* (Halle, 1896); Bielenstein, *Ein glückliches Leben* (Riga, 1904); Brentano, *Lehrbuch der lettischen Sprache* (Vienna, c.1907); Wolter, "Die lettische Literatur," in *Die ost-europäische Literaturen* (Berlin, 1908); Kalning, *Kurzer Lettischer Sprachführer* (Riga, 1910). Among the latest literary histories in Lettic may be mentioned: Klaushush, *Latweeschu vakstneezibas wehsture* (Riga, 1907); Pludons, *Latwiju literaturas vēsture* (Jelgava, 1908–09); Lehgolnis, *Latweeschu literaturas wehsture* (Riga, 1908).

LETTRES DE CACHET, lĕ'tr' de kȧ'shȧ' (Fr., letters of seal). The name given to the warrants of imprisonment issued by the kings of France before the Revolution and used to imprison people of high birth for political and social reasons often of a private nature. They were written on ordinary paper, signed by the King and countersigned by one of the secretaries of state and sealed with the King's little seal (cachet). They differed from the lettres patentes, or formal letters of authorization, which were open, signed by the King, countersigned by a minister, and bore the great seal of state. Lettres patentes required to be registered by the parlements; but lettres de cachet, as the expression of the King's will in matters presumably private, were exempt from the jurisdiction of the parlements. By the lettres de cachet the royal pleasure was made known to individuals or to corporations, and the administration of justice was often interfered with. The use of lettres de cachet began in the fourteenth century, but became especially frequent after the accession of Louis XIV. It was very common for persons to be arrested upon such warrants and confined in the Bastille (q.v.), or some other state prison, where many of them remained for a very long time, and some for life, either because it was so intended or in other cases because they were forgotten. These warrants were used by the King and those who had sufficient influence at court to obtain them for the purpose of getting rid of personal enemies and often of relatives whose actions were embarrassing or unpleasant. The lieutenant general of police kept forms of lettres de cachet ready, in which it was only necessary to insert the name of the individual to be arrested. Sometimes an arrest by lettres de cachet was resorted to in order to shield criminals from justice. Lettres de cachet were issued in great numbers after the revocation of the Edict of Nantes (1685) for the purpose of breaking up Protestant households. Their use declined under the Regency, but during the early part of the reign of Louis XV they were employed by the Jesuits as a powerful weapon of persuasion —80,000 lettres de cachet being issued, it is stated, during the ministry of Cardinal Fleury. In the course of time the abuse of the lettres de cachet became notorious. A regular traffic in them was carried on by the King's mistresses, and for the sum of 25 louis d'or any man might rid himself of his enemy with secrecy and expedition. The lettres were often issued *en bloc* without the name of the person to be arrested, the recipient entering names at will. The Parlement frequently protested against the criminal misuse of the lettres de cachet, and their suppression was universally demanded on the eve of the Revolution. They were abolished by the National Assembly, Jan. 15, 1790. Consult: Honoré Mirabeau, *Les lettres de cachet et des prisons d'état* (Hamburg, 1782); Funck-Brentano, *Les lettres de cachet en blanc* (Paris, 1897); André Cassaigne, *Les lettres de cachet sous l'ancien régime* (ib., 1903); Funck-Brentano, *Les lettres de cachet à Paris* (ib., 1904).

LETTRES DE FEMMES, de fȧm (Fr., letters of women). A collection of graceful but often indecent tales by Marcel Prévost (1892), followed in 1894 by *Nouvelles lettres de femmes* and in 1897 by *Dernières lettres de femmes*.

LETTRES DE MON MOULIN, de môɴ mōō'lăɴ' (Fr., Stories from my Mill). A series of stories by Alphonse Daudet (1869), which first appeared in *L'Evénement*.

LETTRES PERSANES, pĕr'sȧn' (Fr., Persian Letters). A criticism and satire on French affairs by Montesquieu, published anonymously at Amsterdam in 1721.

LETTRES PROVINCIALES, prȯ'văɴ'syȧl'. See Pascal, Blaise.

LETTS. A branch of the Letto-Lithuanian group of the Aryan family, living in the Russian governments of Courland, Livonia, Vitebsk, Kovno, and Pskov, and in East Prussia. A number have migrated to the United States and Brazil. They differ little in physical appearance from the Lithuanians, but are less modified by German, Finnish, and other peoples, and they retained some of their pagan customs down into the eighteenth century. The Letts are estimated to number about 1,350,000 to 2,000,000. They are mostly Protestants. See Lettic Language and Literature.

LETTUCE, lĕt'ĭs (OF. *letuce, laitue, letue,* Fr. *laitue,* from Lat. *lactuca,* lettuce, from *lac,* milk), *Lactuca.* A genus of plants belonging to the family Compositæ. The garden lettuce (*Lactuca scariola,* or *Lactuca sativa*) is supposed to be a native of the East Indies, but is not known to exist anywhere in a wild state. From remote antiquity it has been cultivated in Europe as an esculent and particularly as a salad. It has a leafy stem, oblong leaves, a spreading, flat-topped panicle, somewhat resembling a corymb, with yellow flowers, and a fruit without margin. It is now generally cultivated in all parts of the world where the climate admits of it. The many varieties are divided into two groups: cos (or romaine) and cabbage lettuce—the former having the leaves more oblong and upright, requiring to be tied together for blanching; the latter with rounded leaves, which spread out near the ground. Lettuce is generally eaten raw, with vinegar and oil, more rarely as a boiled vegetable. When grown in gardens, the seed is planted in rich, loose soil as early in the spring as the ground can be worked. Market gardeners grow the seedling plants in the greenhouse or hotbed and transplant 8–12 inches apart in the open field after the plants have been well hardened off. The forcing of lettuce in greenhouses has been an important industry in the vicinity of large cities in the northern and eastern United States. In recent years these cities have been partially supplied from the crop grown in Florida and other southern regions during the winter. The other species of this genus exhibit nothing of the bland quality of the garden lettuce. The strong-scented lettuce (*Lactuca virosa*) is distinguished by the prickly keel of the leaves and by a black, smooth seed, with a rather broad margin. The dried milky juice of this species yields lactucarium, used in medicine as a mild anodyne and narcotic.

Lettuce Diseases. Lettuce, especially when forced or grown under glass, is liable to one or two serious fungous troubles. The most serious is known as wilt, rot, or drop, which is due to attacks of *Sclerotinia libertiana.* The presence of the fungus may be noted by a dark-colored decayed spot on the stem near the ground, or the appearance of water-soaked areas on the leaves, which spread, and the whole plant collapses. Since the fungus is a soil growth, steaming the soil before planting in the benches is recommended. A temperature of 175° to 200° is deemed sufficient if continued for an hour or more. Lettuce will grow at a temperature below that required for the development of the fungus—a fact of which advantage may be taken. A gray mold due to *Botrytis cinerea* attacks the leaves, causing wilted patches soon covered by the fruiting bodies of the fungus. Weak plants succumb to the attack. Ventilation, reduction of temperature, and generally better management will reduce losses from this disease. Lettuce is also subject to damping off due to *Corticium vagum solani.* A mildew (*Bremia lactucæ*) attacks lettuce in the same condition as the rot. Care in ventilation will to a great degree control this disease. A rust due to *Puccinia prenanthis* and a leaf spot caused by *Septoria consimilis* sometimes attack lettuce, but aside from temporary disfigurement seldom occasion much loss. See Plate of SALAD PLANTS.

LETTUCE BIRD. The American goldfinch (q.v.).

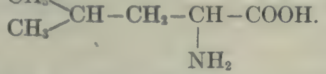
LEUBE, loi′be, WILHELM (1842–). A German physician, specialist in diseases of the digestive organs. He was born at Ulm and studied medicine and chemistry at Tübingen, Zurich, Berlin, and Munich. In 1868 he became clinical assistant at Erlangen, in 1872 professor of pathology and therapeutics and director of the medical clinic at Jena, and in 1885 professor and director of clinic at Würzburg. He retired in 1911. Leube specialized in physiological chemistry; with Rosenthal prepared a "digested food" ("Leubes Fleischsolution"); and wrote: *Ueber die Wirkung des Dünndarmsaftes* (1868); *Ueber die Ernährung vom Mastdarm aus* (1872); *Die Krankheiten des Magens und Darms* (2d ed., 1878); *Behandlung der Urämie* (1883); *Chemie in der Medizin* (1884); *Spezielle Diagnose der innern Krankheiten* (8th ed., 1894–98).

LEUCA′DIA. One of the Ionian Islands. See SANTA MAURA.

LEUCHSENRING, loiK′sen-rĭng, FRANZ MICHAEL (1746–1827). A German man of letters, born at Langenkandel in Alsace. Leuchsenring was a friend of Jacobi, Herder, Goethe, and Wieland for a time, but they all broke with him, and Goethe portrayed him in no flattering colors in his farce *Pater Brey.* He also describes him in *Dichtung und Wahrheit.* He was a sentimentalist, a member of the Illuminatenorden, and continually suggested among his friends the foundation of a secret order of sentimentality. Consult J. W. von Goethe, *Dichtung und Wahrheit,* book xiii; also *Briefe an und von Merck;* Varnhagen von Ense, *Vermischte Schriften,* vol. iv (Mannheim, 1838).

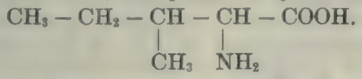
LEUCHTENBERG, loiK′ten-bĕrK. See BEAUHARNAIS.

LEUCINE, lū′sĭn (from Gk. λευκός, *leukos,* white; connected with Lat. *lux,* light, OIr. *lóche,* lightning, OChurch Slav. *luča,* ray, Skt. *ruc,* to shine, OHG. *lioht,* Ger. *Licht,* AS. *lēoht,* Eng. *light*), or AMINO-CAPROIC ACID, $C_6H_{13}NO_2$. A name applied to four isomeric acids, of which three, viz., levo-leucine, dextro-iso-leucine, and normal leucine, exist chemically combined in the proteins and are, therefore, substances of importance. The most commonly found of these isomers is levo-leucine, which also occurs in the uncombined state in the animal body. It crystallizes in white (whence the name leucine) leaflike crystals that melt at 280° and are moderately soluble in water. Its aqueous solution (in the absence of alkalies) turns the plane of polarized light to the left (whence the prefix "levo"). Prolonged heating in barium hydroxide solution transforms half of the levorotatory into the dextrorotatory modification, the resulting mixture, of course, being optically inactive. This inactive, or racemic, mixture is attacked by green mold (*Penicillium glaucum*), the levo-modification being destroyed much more rapidly than the dextro, so that it is possible to obtain the dextro-modification (which does not occur in nature) practically free from the antipodal modification. The constitution of either levo- or dextro-leucine is represented by the formula:



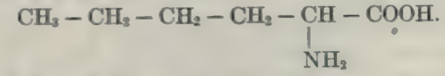
Inactive or racemic leucine (i.e., a mixture of the dextro- and levo-modifications) has also been obtained by several different synthetic methods.

Dextro-iso-leucine, as shown by Ehrlich and Wendell in 1908, probably always accompanies levo-leucine among the degradation products of the proteins. It is fairly soluble in cold water and the solution rotates the plane of polarized light to the right. Prolonged heating with barium hydroxide turns it into a racemic mixture, which is optically inactive. The constitution of iso-leucine (whether the dextro- or the levo-modification) is represented by the formula:



$$CH_3 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle NH_2}{\underset{|}{CH}} - COOH.$$

Normal leucine, the third important modification of leucine, probably occurs chemically combined in casein. Its two optical isomers, the dextrorotatory and the levorotatory, as well as the racemic (inactive) form, are known. The chemical constitution of normal leucine is represented by the formula:



$$CH_3 - CH_2 - CH_2 - CH_2 - \underset{NH_2}{\underset{|}{CH}} - COOH.$$

LEUCIP'PUS (Lat., from Gk. Λεύκιππος, *Leukippos*). The founder of the atomistic school of Greek philosophy and forerunner, by some 40 years, of Democritus (q.v.). Nothing is known of his life. Consult: Lortzing, in Conrad Bursian (ed.), *Biographisches Jahrbuch für Alterthumskunde*, vol. cxvi (Berlin, 1904); Theodor Gomperz, *Greek Thinkers*, vol. i (Eng. trans., New York, 1905); John Burnet, *Early Greek Philosophy* (2d ed., ib., 1908).

LEUCITE, lū'sīt (from Gk. λευκός, *leukos*, white). An aluminium and potassium silicate, dimorphous in crystallization, being isometric only above a temperature of 500° C. It is translucent to opaque, with a vitreous lustre and a smoky-gray color. Leucite occurs chiefly in volcanic formations, and the best-known localities are Vesuvius and Mount Somma in Italy, where it is disseminated in grains through the lava: also in the United States at various localities in Wyoming. Millstones of this leucite lava have been found in the excavations at Pompeii. The white varieties are called *white garnet*, owing to their resemblance to the trapezohedral crystals of garnet.

LEUCKART, loi'kärt, RUDOLF (1822–98). A German zoölogist, born in Helmstedt. He studied at Göttingen and, after teaching a few years there, became, in 1850, professor of zoölogy at Giessen; and at Leipzig in 1870. His earliest contributions to zoölogy were epoch-making in that he divided Cuvier's type Radiata into Echinodermata and Cœlenterata and grouped the remainder of the animal kingdom under the four heads of Vermes, Arthropoda, Mollusca, and Vertebrata—a classification which in the main holds at the present time. He published on a wide variety of subjects, but during the latter half of his life devoted himself almost exclusively to the study of parasitic worms and became the greatest authority of his time on them. Of his numerous publications, the following are important: *Beiträge zur Kenntnis der wirbellosen Thiere* (1847, with H. Frey); *Ueber Morphologie und Verwandtschaftsverhältnisse der wirbellosen Thiere* (1848); *Ueber den Polymorphismus der Individuen oder die Erscheinungen der Arbeitsteilung in der Natur* (1851); *Ueber die Mikropyle und den feineren Bau der Schleimhaut bei den Insecteneiern* (1885); *Die Blasenbandwürmer und ihre Entwickelung* (1856); *Untersuchungen über Trichina Spiralis* (1860; 2d ed., 1866); *Die Parasiten des Menschen* (2 vols., 1863–76; 2d ed., 1879–89; Eng. trans., *The Parasites of Man*, 1886); *Zoologische Wandtafeln* (1877–98).

LEU'COCYTE (from Gk. λευκός, *leukos*, white + κύτος, *kytos*, cell). A lymphoid or amœboid cell. The name is generally applied to lymph cells outside the blood vessels and to the white corpuscles of the blood (q.v.). The source of the white cells of the blood is undoubtedly the lymphatic glands as well as the bone marrow, the spleen, and the gastrointestinal lymph follicles. See BLOOD.

LEU'COCYTHÆ'MIA (Neo-Lat., from Gk. λευκός, *leukos*, white + κύτος, *kytos*, cell + αἷμα, *haima*, blood); also known as leukæmia. A disease characterized by a great increase in the number of white corpuscles in the blood, together with changes in the bone marrow, spleen, and lymphatic glands. The disease was first noted in 1841 by Bennett, of Edinburgh, who considered the affection due to the presence of pus in the blood and gave it its name. In the same year Virchow, of Würzburg, published his observations upon the disease and was the first accurately to recognize and describe it. He gave it the name "leukæmia." Virchow's theory of the pathogenesis has been adopted, viz., that it is primarily a disease of the blood-making organs, and that the conditions of the blood are secondary. The disease is common among the working classes, and the majority of the cases occur between the twentieth and fiftieth years. It is twice as common among men as among women. Malaria syphilis, and traumatism are supposed to have an influence as predisposing causes; but there is great reason to believe that the disease is essentially infectious in its nature. The symptoms of the disease are pallor, or an ashen color; palpitation of the heart; dyspnœa upon exertion; enlargement of the lymphatic glands, in bunches, most frequently in the neck; great enlargement of the spleen, with tenderness in the splenic region; enlargement of the liver; diarrhœa; nervous disturbances, including headache, languor, depression, delirium, or even mania; a tendency to hemorrhage; deafness, and vertigo. Two varieties of the disease were first definitely recognized by Ehrlich in 1883, but there are many atypical cases. An examination of the blood will readily determine the presence of the disease and will decide whether the case in hand is of the myelogenous or the lymphatic variety. In the former, which is the more frequent form, there is an excess of the large mononuclear cells, especially of the myelocytes; and also large numbers of nucleated red corpuscles, notably of megaloblasts. In the lymphatic variety there is an unusual proportion of lymphocytes of the ordinary type, or rather large, with paler nuclei and almost wholly without granules; while myelocytes and nucleated red corpuscles are present in very small numbers. Leucocythæmia is almost invariably fatal. The disease may run a course of from five to eight years, though the average duration is less than three years. An unusually rapid form, called by Von Leube *leukanæmia*, is combined with a severe anæmia and ends in death sometimes in a few days. Amelioration of the symptoms may be secured by treatment in some cases. Freedom from care, change of climate, a diet in which carbohydrates and fats are prominent, arsenic, quinine, bone marrow, bitter tonics, and iron are all serviceable. Cold douches to the splenic region as well as faradization or galvanization of this region have relieved the pain or discomfort experienced there. Anorexia, indigestion, constipation, and diarrhœa demand special remedies. The most promising treatment is the employment of the X rays. By this means patients are improved and often kept alive and in comfort for years. As yet no assurance of permanent cure can be given. The enlarged splenic area, and sometimes the liver, the epiphyses of the long bones, and the thorax, are exposed to the radiations. Benzol taken internally has been extolled by some clinicians, but the evidence as to its value is very conflicting.

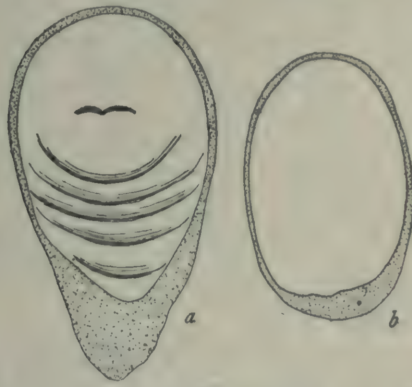
Consult Osler, *On Splenic Anœmia* (New York, 1900); article by Cabot in Osler, *Modern Medicine* (ib., 1914); Naegeli, *Leukaemie und Pseudoleukaemie* (Vienna, 1913).

LEUCO′JUM. See Plate of MOUNTAIN PLANTS.

LEUCOLINE, lū′kō-lĭn. See QUINOLINE.

LEUCO′MA (Neo-Lat., from Gk. λεύκωμα, *leukōma*, white spot in the eye, from λευκοῦν, *leukoun*, to whiten, from λευκός, *leukos*, white). The term applied to a white opacity of the cornea. It is also called albugo. It is the result of acute inflammation or ulceration, giving rise to the deposition of coagulable lymph on the surface or between the layers of the cornea. It is sometimes reabsorbed on the cessation of the inflammation, and the cornea recovers its transparency; but in many cases it is persistent and incurable. It may also be the result of previous ulceration or of injury to the cornea. The mildest degree of opacity is known as nebula, and a grade intermediate between this and leucoma as macula. When perforation of the cornea is followed by adhesion of the iris to the resultant scar, the condition is spoken of as adherent leucoma.

LEU′COPLASTS (from Gk. λευκός, *leukos*, white + πλαστός, *plastos*, formed, from πλάσσειν, *plassein*, to form). Minute colorless bodies (also called *Amyloplasts*), whose special function it is to accumulate starch and sometimes proteids into solid granular form. They are special organs of the protoplasm in active plant cells. Similar to these are the plastids, including chromoplasts and chloroplasts (qq.v.). They may occur in any cell, but are mostly readily observed, because most abundant, in cells devoted to storage of reserve food. The starch-forming leucoplasts absorb the dissolved material (sugar?), convert it into starch, and begin to deposit this starch in their interior (see figure). The mature starch grain is usually oval or roundish, rarely irregular. Structurally it is a sphere crystal, being composed of minute hairlike crystals (trichites), which radiate from a centre. Additions to the starch grain, as it is growing, are made exclusively upon its surface. As the starch grain increases in size in the interior of the leucoplast, the latter is stretched. If the grain originates in the centre of the leucoplast, the stretching may be uniform, in which case nearly equal layers may be added to all sides. More often, however, it arises eccentrically, and then the main portion of the leucoplast lies at one side of the starch grain, the smaller portion being stretched until it forms a very thin, almost invisible membrane. In this case the additions to the starch grain will be more rapid on the side where the larger mass of the leucoplast lies. If the leucoplast is ruptured, remaining in contact with only one side of the starch grain, further additions will be confined to portions in contact with the leucoplast (see figure). If a starch grain begins to develop at more than one point, two or more may arise within a single leucoplast, producing the so-called "compound" starch grains. The leucoplast is visible on the larger grains only after special treatment. In some cases leucoplasts accumulate in their interior masses of solid proteids which may or may not take the crystalline form. Such leucoplasts have recently been distinguished by the name "proteinoplasts."



STARCH GRAINS (WHITE) FORMING INSIDE LEUCOPLASTS.

a, an eccentric grain, with the bulk of the leucoplast on one end; *b*, a younger stage of the same.

LEUCOPY′RITE. A silver-white, metallic, sesquiarsenide of iron related to and frequently merging into the diarsenide (lollingite). It occurs with other arsenic ores in Carinthia, in Gunnison Co., Colo., and in Orange Co., N. Y.

LEU′CORRHŒ′A (Neo-Lat., from Gk. λευκός, *leukos*, white + ῥοία, *rhoia*, a flow, from ῥεῖν, *rhein*, to flow), or THE WHITES. A catarrhal discharge from the female generative organs, consisting of mucus or mucus and pus. Leucorrhœa is a symptom of disease of the mucous membrane lining the vagina, or the uterus, or possibly of the Fallopian tubes. Any pathological state which keeps the uterus in a condition of engorgement or of retarded circulation may result in leucorrhœa. It is a very common condition and may be of trivial character. It may be an indication of endometritis or salpingitis. Astringent or antiseptic douches are ordered by the physician if the trouble is simply vaginal. Diseases of the uterine adnexa must be met by appropriate surgical measures. The congestion brought about by a misplaced uterus is often responsible for the phenomenon. In many cases it has latterly been found that colon-bacillus infection keeps up the flow. This is successfully treated by a vaccine prepared from this microörganism.

LEUCOSTICTE, lū′kō-stĭk′tē (Neo-Lat., from Gk. λευκός, *leukos*, white + στικτός, *stiktos*, pricked, spotted, from στίζειν, *stizein*, to prick). The generic name of a group of large fringilline birds which inhabit the higher parts of the mountains of the western United States and are often called "rosy finches" because of the red mixed with the brown of their plumage. Consult: Elliott Coues, *Birds of the Northwest* (Washington, 1874); L. S. Keyser, *Birds of the Rockies* (Chicago, 1902); Dawson and Bowles, *The Birds of Washington* (Seattle, 1909).

LEUCOTH′EA. See INO.

LEUC′TRA (Lat., from Gk. Λεῦκτρα, *Leuktra*). A village of Bœotia in Greece (Map: Greece, Ancient, C 2), famous for the great victory which the Thebans under Epaminondas (q.v.) won here over the Spartan King Cleombrotus (371 B.C.), in consequence of which the Spartan supremacy in Greece, which had existed since the close of the Peloponnesian War (404 B.C.), was broken forever. See GREECE, *Ancient History;* THEBES; SPARTA.

LEUKÆ′MIA. See CHILDREN, DISEASES OF; LEUCOCYTHÆMIA.

LEUKERBAD, loi′kĕr-bät (Fr. *Loèche-les-*

Bains). A watering place in the Canton of Valais, Switzerland, about 10½ miles, by road, north of Leuk (Loèche Ville) (Map: Switzerland, B 2). It is situated near the head of the Devla valley at the entrance to the Gemmi Pass (q.v.), and at an elevation of 4629 feet above sea level. It has about 22 baths, impregnated with lime and having a temperature varying from 88° F. to 124° F. During the season (July to September) the baths are frequented by large numbers of visitors. The village is exposed to avalanches and was destroyed in 1518, 1719, and 1756. A strong embankment now guards it from a repetition of a similar catastrophe. The resident population is about 700. The visitors during the summer season bring the temporary population to about 1500.

LEU′KODER′MIA. See Vitiligo.

LEUMANN, loi′män, Ernst (1859–). A specialist in the philology and antiquities of India. He was born at Berg, near Weinfelden, Switzerland, and received his first training in comparative philology at the Frauenfeld Gymnasium. He completed his education at the universities of Geneva, Zurich, Leipzig, and Berlin, and after a two years' stay at Oxford went to Strassburg, where he taught Sanskrit after 1884, becoming professor in 1897. His works include editions of the *Aupapātika Sūtra*, a Jaina treatise (1883), and *Avaśyaka-Erzählungen* (1897); a translation of *Kathakoça, or Treasury of Stories* (1897); an excellent *Sanskrit-English Dictionary* (1899), in collaboration with Monier-Williams and Cappeler, which was followed by the *Etymologisches Wörterbuch der Sanskrit Sprache,* part i (1907); *Zur Nord-Arischen Sprache und Literatur* (1912); and several papers published in *Zeitschrift der deutschen morgenländischer Gesellschaft.*

LEURET, lẽ′rȧ′, François (1797–1851). A French alienist, born in Nancy. He made a special study of the treatment of the insane and ultimately became director of the asylum at Bicêtre (1829). His works include: *De la fréquence du pouls chez les aliénés* (1832), with Mitivié; *Fragments psychologiques sur la folie* (1834); *Anatomie comparée du système nerveux* (1839–58), completed by Gratiolet; *Du traitement moral de la folie* (1840).

LEUTHEN, loi′ten. A village of Lower Silesia, Prussia, 9 miles west of Breslau, celebrated for the victory won there Dec. 5, 1757, by Frederick the Great, with 34,000 men, over an Austrian army of about 90,000 under Prince Charles of Lorraine. The loss of the Austrians was 10,000 in killed and wounded, 12,000 in prisoners, besides 51 standards and 116 pieces of artillery. The victorious army lost 6500 in killed and wounded. The result was the reconquest of the greater part of Silesia by the Prussians. A monument was erected in 1854. Pop., about 800.

LEUTHOLD, loit′hōlt, Heinrich (1827–79). A German poet, born near Zurich and educated in that city and in Basel. His brief literary activity, mostly in Munich and Frankfort, was brought to an end by insanity, and he died in an asylum near Zurich. He was one of the most gifted members of the Munich group of poets. In collaboration with Geibel, Leuthold translated selected French lyrics (1862). He showed great beauty of form and much depth of thought in his lyrics and the (practically lyric) epic *Penthesilea,* posthumously published (1879). Consult: L. Ganghofer's novel *Die Sünden der Väter* (Stuttgart, 1886); A. W. Ernst, *H. Leuthold, ein Dichterporträt* (2d ed., Hamburg, 1893); id., *Neue Beiträge zu H. Leutholds Dichterporträt* (ib., 1897); Paul Heyse, *Jugenderinnerungen und Bekenntnisse* (5th ed., Berlin, 1912).

LEUTZE, loit′se, Emanuel (1816–68). A German-American historical painter of the Düsseldorf school. He was born in Gemünd, Württemburg, May 24, 1816. His parents came to the United States, settling first in Philadelphia, then at Fredericksburg, Va. He received his first instruction in art from J. A. Smith, a portrait painter, in Philadelphia. In 1840 one of his pictures attracted attention and procured him several orders, which enabled him to go to Düsseldorf, where he studied with Lessing. In 1842 he went to Munich, studying the works of Cornelius and Kaulbach, and the following year he visited Venice and Rome. In 1845 he returned to Düsseldorf and was married, making his home there for 14 years. He devoted himself to American, Spanish, and English historical subjects, especially to the famous series of pictures of the Revolution, of which "Washington Crossing the Delaware" (1851–52, in the Bremen Gallery, with a replica in the Metropolitan Museum, New York) is the finest. In 1859 he returned to the United States; in 1860 he received the commission for the fresco on the staircase of the Capitol at Washington, entitled "Westward the Star of Empire Takes its Way." In 1860 he was elected a member of the National Academy. He died in Washington, D. C., July 18, 1868, leaving several large cartoons for the decoration of the Senate Chamber.

Leutze is more famous for the subjects than for the technical qualities of his paintings. His color is often crude and his drawing academic, yet his composition is good, and his figures show a high power of individualization. The most important works are: "Columbus before the Council of Salamanca" (1841, purchased by the Düsseldorf Art Union); "Columbus in Chains" (1842); "Columbus before the Queen"; "Landing of the Norsemen in America" (Pennsylvania Academy, Philadelphia); "Cromwell's visit to Milton" (Corcoran Gallery, Washington); "The Amazon and her children" (ib.); "The Court of Queen Elizabeth"; "Henry VIII and Anne Boleyn" (1858); "The Iconoclast"; "Washington at Monmouth"; "Washington at the Battle of Monongahela"; "News from Lexington"; "Washington at Princeton"; "Lafayette in Prison at Olmütz Visited by his Relatives" (1861); "Westward Ho"; portraits of Lincoln, Grant, General Burnside, and Worthington Whittredge (Metropolitan Museum).

LEUTZE, Eugene Henry Cozzens (1847–). An American naval officer, born at Düsseldorf, Prussia. He graduated from the United States Naval Academy in 1867 and was promoted through the various grades to captain in 1901 and rear admiral in 1907. He commanded the *Michigan* (1896–97), the *Alert* (1897–98), and the *Monterey* (1898–99); participated in the capture of the city of Manila; had charge of the Navy Yard, Cavite, P. I. (1898–1900); superintended the naval-gun factory at Washington, D. C. (1900–02); and was captain of the new *Maine* (1902–04). He served on the Board of Inspection and Survey (1904–05) and was commandant of the Washington Navy Yard and superintendent of the naval-gun factory (1905–10). Retired by operation of the law in 1909, he continued in active service, being commandant of the New York Navy Yard and station in 1910.

LEVAILLANT, le-vȧ′yäɴ′, FRANÇOIS (1753–1824). A French ornithologist and traveler, born at Paramaribo, Dutch Guiana. From 1781 to 1785 he traveled in South Africa, studying the natives and making collections of the birds and large mammals. His works include: *Voyage dans l'intérieur de l'Afrique* (1790; 2d ed., 1803); *Second voyage dans l'intérieur de l'Afrique* (1796; 2d ed., 1803); *Histoire naturelle des oiseaux d'Afrique* (1796–1812).

LEVANT′ (OF., Fr. *levant*, ML. *levans*, Orient, sunrise, from Lat. *levare*, to raise, from *levis*, light), THE. A name employed throughout the whole of Europe to designate the eastern parts of the Mediterranean Sea and adjacent countries. In a wider sense, it is applied vaguely to the regions eastward from Italy, as far as the Euphrates and the Nile; but more generally is used in a more restricted sense, as including only the coasts of Asia Minor, Syria, and Egypt.

LEVA′RI FA′CIAS (Lat., Do thou cause to be levied). An old common-law writ of execution directed to the sheriff of the county, requiring him to levy on the chattels and the profits of the land of a judgment debtor till satisfaction should be made to the judgment creditor. In England the writ had, by the middle of the eighteenth century, been superseded by the writ of elegit and in 1883, by the Bankruptcy Act, it was abolished as a process for enforcing civil judgments, though it is still employed under certain circumstances to enforce payment of a fine imposed in criminal proceedings. In the United States the process lasted longer, but has now generally been displaced by the ordinary writ of execution. See EXECUTION.

LEVASSEUR, le-vȧ′sẽr′, EMILE (1828–1911). A French political economist and statistician, born Dec. 8, 1828, in Paris. After studying at the Lycée Bonaparte, the Collège Bourbon, and the Ecole Normale Supérieure, he was professor in various lycées until 1868, when he was put in charge of a course at the Collège de France. There he became professor in 1872. He had previously (1868) been elected member of the Academy of Moral and Political Science, of which he was thrice laureate. He was active in promoting international congresses for the discussion of statistical and geographical topics, was one of the founders of the French Society of Commercial Geography, served on many commissions, and was president of various economic societies. His works include: *Le question d'or* (1858); *L'Histoire des classes ouvrières en France* (*avant 1789*, 2 vols., 1859, 2d ed., 1901; *de 1789 à 1870*, 2 vols., 1867, 2d ed., 1904); *Précis d'économie politique* (2 vols., 1863–77; Eng. trans., *Elements of Political Economy*, 1905); *La population française* (3 vols., 1889–92); *La France et ses colonies* (3 vols., 1890–92); *L'Enseignement primaire dans les pays colonises* (1897). Levasseur visited the United States in 1893 for the Columbian Exposition. The fruits of his study of the economic conditions of the United States are embodied in *L'Agriculture aux Etats-Unis* (1894) and *L'Ouvrier americain* (2 vols., 1898; Eng. trans., *The American Workman*, 1900). Later writings include: *Les études sociale sous la Restauration* (1902); *Précis d'économie politique* (1905); *Questions ouvrières et industrielles sous la troisième république* (1907); *Histoire du commerce de la France* (part i, 1911; part ii, 1912). Consult the address delivered on Levasseur's jubilee, *Emile Levasseur, 1828, 1868, 1908* (Paris, 1909).

LEVEE, lĕv′ē̇ *or* lĕ-vē′ (Fr. *levée*, a raising, embankment, from *lever*, to raise, from Lat. *levare*, to raise). The name applied to an embankment constructed along the margin of a river to restrain its waters within the natural channel during floods, and particularly the name given to the flood embankments of the Mississippi River. The so-called dikes of Holland and of various European rivers and the flood embankments of the rivers Danube, Vistula, and Po are examples of levees according to the American usage of that term. The levees of the Mississippi River aggregate over 1200 miles in length and are strung along a stretch of about 1000 miles of river from Cairo to the Mexican Gulf. The construction and maintenance of these levees are in charge of commissions maintained by the various States bordering on the river, and of a similar organization maintained by the United States government and known as the Mississippi River Commission. The Mississippi River Commission did its first work of levee building in 1882, but the various State commissions had begun construction long before that time. As early as 1717 De la Tour, who laid out the city of New Orleans, provided for a levee in front of the city which, however, was not completed until some 10 years later. The government levees are built to standard forms and dimensions varying with the height of the embankment required; roughly described, they are embankments of earth having a broad bottom and narrower top and sloping sides. They are constructed by depositing earth in layers on a foundation cleared of all roots and stumps and thoroughly plowed, and then sodding the top and sides with Bermuda grass at two-foot intervals. After the floods of 1912 and 1913, during which there were numerous failures of levees due to various defects, the Mississippi River Commission undertook the construction of experimental levees in order to determine whether a smaller section levee whose face was protected with concrete deposited from a cement gun and with interlocking sheet piling at the foot of the levee would decrease the protection so as to keep the levee dry during the period of highest flood. Such protection was found most serviceable in the experimental installation and the smaller section was found more economical than the large unprotected levee. For a description of the Mississippi River levees, consult Starling, "The Levees of the Mississippi River," *Engineering News*, vol. xxv, and Copee, "Standard Levee Sections," *Transactions of the American Society of Civil Engineers*, vol. xxxix. An excellent discussion of the levees and other features of flood protection along the Mississippi by engineers familiar with local conditions may be found in vol. xlix, *Journal of the Association of Engineering Societies* (Boston, 1912), while a valuable collection of papers, reports, hearings, and general consideration of the subject, *Floods and Levees of the Mississippi River*, by B. G. Humphreys, member of Congress from Mississippi, was published by the Mississippi River Levee Association of Memphis, Tenn. (Washington, 1914). Consult also current files of leading engineering journals, annual reports of the United States army chief of engineers and of the Mississippi River Commission; and for a concise summary of levee construction, *American*

Civil Engineers Pocket Book (2d ed., New York, 1913). (See Drainage; Embankments.) The article Mississippi River contains a full account of the history and construction of the various improvements on that river, including the system of levees.

LEVEE, lĕ-vē′; Brit. lĕv′ē. In its most general sense, a miscellaneous assemblage of guests, a reception, and often a morning reception; more specifically, the state ceremonial of any sovereign receiving visits from those subjects whose position entitles them to that honor. By the usage of the court of Great Britain, a levee differs from a drawing-room in this respect, that gentlemen only are present (excepting the chief ladies of the court), while at a drawing-room both ladies and gentlemen appear. The name arises from the ceremonial attending the rising of the King of France under Louis XIV and his successors. The *grand lever* was the more public, after the King had been shaved and invested with his wig; the *petit lever*, more intimate, was held immediately after he had been awakened and had said his prayers. Even to this a large number of privileged people were admitted, successively in five classes, comprising not only the royal family, but all kinds of officials, domestic, civil, and military. Under Louis XVI, whose tastes were simple and who rose at seven or eight o'clock, the ceremonial *lever* was usually postponed until half past eleven, thus approximating more nearly to the modern levee.

LEV′EL (OF. *livel*, *liveau*, *liveal*, *nivel*, *niveau*, Fr. *niveau*, Sp. *nivel*, *nivello*, Port. *livel*, *nivel*, It. *livello*, from Lat. *libella*, level, balance, diminutive of *libra*, balance, pound). A name especially used in ore mining and referring to the horizontal excavations made at regular intervals from the shaft (q.v.), and used as a traveling way and for transporting the broken ore to the shaft for hoisting. Levels are usually driven in the ore body or in the footwall parallel with the strike of the ore body and a few feet from it. The distance between levels depends on the mining methods adopted and the size and inclination of the ore body. They are commonly 50 to 150 feet apart, but in some of the very deep mines in South Africa this distance has been increased to 400 feet. When the levels are driven in the footwall crosscuts are driven connecting the level with the ore body. In some regions, such as the anthracite region of Pennsylvania, the term "gangway" is used instead of level, and the main gangway is called the entry.

LEV′ELERS. An ultra-reform party which, under the leadership of John Lilburne, became strong in the army of the Long Parliament, when the army overawed that body, and sent Charles I to Hampton Court in 1647. They determined to level all ranks and establish an equality of titles and estates throughout the Kingdom. Several of the officers belonging to this party were cashiered in 1649; and on the departure of Cromwell for Ireland, at the close of that year, they raised mutinies in various quarters, which were suppressed by Fairfax with bloodshed. One of their works, *The Leveler, or the Principles and Maxims Concerning Government and Religion of those Commonly Called Levelers*, shows that in politics their fundamental principles included: (1) the impartial authority of the law; (2) the legislative power of Parliament; (3) absolute equality before the law; (4) the arming of the people for securing the enforcement of the laws and the protection of their liberties. In religion they claimed: (1) absolute liberty of conscience; (2) freedom for every one to act according to his knowledge, even if this knowledge should be false; (3) the consideration of religion in two aspects—one as the correct understanding of revelation, which is a private affair, the other as its effects manifested in actions, which are subject to the authorities. They condemned all strife on matters of faith and forms of worship. This sect disappeared at the time of the Restoration. Consult S. R. Gardiner, *History of the Great Civil War* (London, 1898). See Agreement of the People.

LEV′ELING. The operation of ascertaining the difference of elevation between any two points on the surface of the earth. Leveling is employed to find the relative elevation of points a considerable distance apart, to obtain the profile of a line to establish a grade, or to determine absolute elevations above any particular point of reference. These points may be more or less intermingled in any piece of work. For convenience of discussion, leveling operations, which play a most important part in surveying, may be broadly classed into common spirit leveling, trigonometrical leveling, and precise spirit leveling. The difference between the first and the third classes lies chiefly in the degree of accuracy with which the work is performed.

Spirit-leveling operations are essentially the same whatever their object may be. For example, suppose it is required to determine the difference in elevation between two distant points. The instruments are the Y level and the level rod, forms of which are described and illustrated in the article Surveying Instruments (q.v.). The rod is set up on the starting point, whose elevation should be known, and the level is placed on its tripod a convenient distance away in the direction of the other point, and where a plain view may be had of the level rod. When the level is adjusted, the levelman takes a reading on the graduated level rod at the starting point and records it in his notebook. The rodman then moves his rod to a point ahead of the level, and the levelman, swinging his telescope with its level around in a horizontal plane, takes another reading, which he likewise records. This reading is called a foresight, in contradistinction to the first reading, which is called a backsight. The levelman then removes his level to a point ahead of the second position of the rod, sets it up, adjusts it, and takes a backsight reading on the rod. This being recorded, the rodman moves to a new position ahead of the level, where he sets up the rod on which the levelman takes a foresight reading, and then moves again to a new position ahead of the rodman. By means of sufficient repetitions of these operations the distance between the two points whose differences in elevation are to be determined is traversed, the last reading being taken with the rod set up on the finishing point.

When the final reading has been taken, a simple calculation in addition and subtraction performed on the recorded readings gives the levelman the result he desires, which is the difference in elevation between the starting and the finishing points.

The starting point is referred to some position whose altitude is definitely known and marked, which is termed a bench mark (q.v.), this in turn being referred to some precise bench or to the seacoast where mean sea level has been fixed after many tidal observations and a datum plane established.

In conducting such a series of readings as has been described, the attempt is always made to make the lengths of the backsight and foresight for each setting of the level as nearly equal as possible, and also to make them as long as possible consistent with clearness of sight.

It is in this way that the profile of the route of a railway line, canal, or highway is determined. Having obtained the natural profile, the engineer in railway or road building has to cut down the irregularities by means of one or more uniform gradients. These he determines first on paper, figuring out the rate of ascent or descent. Supposing that he has determined a grade of 1 foot in 100 feet, then each succeeding intervening point is 1 foot higher or lower, according to direction, than the preceding point. The levelman then reruns his line of levels according to this adopted gradient, and marks on the stake at each intervening point the elevation at which its top is above or below the adopted grade line.

Precise spirit leveling is performed in exactly the same way except that larger and more perfect instruments are employed and more care is taken in making the observations and performing other necessary operations. Furthermore, certain corrections must be applied to the field results, the most important of which are the rod length and rod temperature. As carried on by the United States Coast and Geodetic Survey the method of running a line of precise levels is essentially as follows: The line is always run twice in opposite directions, to furnish a check on the work, and in case of disagreement of the results beyond prescribed limits between additional bench marks, additional runnings may be made. Part of this work consists in the establishment of accurate bench marks for the use of local land surveyors and engineers, and it is stated that for the Coast Survey leveling done since 1899 a maximum discrepancy allowed between two measurements on a section 1.6 kilometers (1 mile) long is 5 millimeters or ⅕ of an inch. For sections of other lengths the discrepancy allowed is made proportional to the square root of the length. A test of the accuracy of this form of leveling is found in the closure of large circuits, 50, 100 or 1000 miles in circumference, where the elevations have been carried from one point continuously in one direction around the circuit, and where the computed elevation for the starting point on closing the circuit should agree with that assumed for it at the start, if there are no errors in the leveling.

By the year 1914 precise leveling had been carried on in the United States, so that there were 85 such circuits varying in circumference from 100 to 4700 miles and extending across the continent. The lines were so interlaced that each line forms a part of two circuits. The greatest error indicated by the closure of the circuit in any one line of the system was 2 millimeters per kilometer, or about ⅛ of an inch per mile, while the average error was .3 millimeter per kilometer, or about $\frac{1}{50}$ of an inch per mile. This was shown in a system which involved nearly 31,000 miles of leveling, participated in by various government engineers, including the corps of engineers of the United States army and other organizations, as well as the Coast and Geodetic Survey. The average closing error of less than 2 millimeters per kilometer has been claimed for the leveling done in recent years by the Coast and Geodetic Survey, which in 1914 had completed over 11,000 miles of precise leveling since its adoption of improved and highly accurate instruments. In this work the average rate of progress was 71 miles per month, each mile being leveled at least twice, once in a forward and once in a backward direction. This work of precise leveling was planned to extend over the United States, so that there would be few points which were not within 100 miles of an accurately determined bench mark.

Trigonometric levelings consist in the determination of the difference of level by vertical angles, measuring the angle of elevation or depression of a distant station, and is usually carried on in connection with triangulation, making use of the theodolite. A sight with the telescope of this instrument may be of very great length in mountainous countries, sometimes exceeding 100 miles. As the distance is known between the object sighted and the station, the difference of elevation between the observer's station and the distant points can readily be computed from the angular measurements made. In trigonometric leveling it is necessary to apply large corrections on account of the refraction of the rays of light coming from the distant point to the observer, an amount that is very variable, being different at different hours of the day, and on different days and in different seasons. As little is known of the laws controlling these changes in refraction, the accuracy of trigonometric leveling is considerably less than that of precise spirit leveling, but by connecting the elevations determined from angular measurements at various points with precise level bench marks it is possible to prevent accumulation of errors and secure greater accuracy for the results of the triangular leveling. Such results are often sufficiently accurate for all purposes except very detailed topography. Several thousand points have thus been determined in various parts of the United States. In fact the officials of the Coast Survey believe that the difference of elevation of two points determined by trigonometric leveling may be correct within 1 or 2 inches to the mile when observations for vertical angles have been made in both directions over the line.

Elevations of different points, as the tops of mountains, are often measured by barometer or by noting the temperature at which water boils. These are not exact methods, and are used only in exploration work. See HYPSOMETRY; ANEROID; BAROMETER.

Bibliography. Breed and Hosmer, *Principles and Practice of Surveying*, vol. ii (New York, 1908); J. B. Johnson, *Theory and Practice of Surveying* (17th ed., ib., 1910); Ingram, *Geodetic Surveying and Adjustment of Observations* (ib., 1911); M. Merriam, *American Civil Engineers' Pocket Book* (2d ed., ib., 1913); United States Coast and Geodetic Survey, *Precise Leveling in the United States* (Washington, 1903, 1907); id., *Hypsometry: Fourth General Adjustment of the Precise Level Net in the United States, and the Resultant Standard Elevations* (ib., 1914); also other publications of the Survey, especially *Annual Reports* (1899, app. 8; 1903, app. 3).

LEVEN, lĕv′′n *or* lē′v′n, LOCH. A picturesque lake in the east of Kinross-shire, Scotland (Map: Scotland, E 3). It is oval in shape, about four miles long and two wide and is 350 feet above sea level. It receives several streams and its waters empty through the Leslie River into the Firth of Forth. It is a famous fishing ground, celebrated for trout. Loch Leven Castle, in which, in 1567, Queen Mary was imprisoned and forced formally to abdicate the throne, and whence she escaped in 1568, is on one of the islets in the lake. Consult Burns-Begg, *History of Lochleven Castle* (Kinross, 1877).

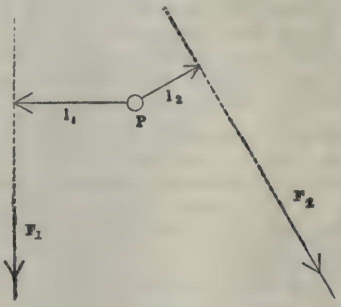
LEVEN, lĕv′en, ALEXANDER LESLIE, first EARL OF (c.1580–1661). A Scottish soldier. He served with Sir Horatio Vere in the Netherlands, and after 1605 under Charles IX and Gustavus Adolphus, kings of Sweden. By 1626 he had attained the rank of lieutenant general under Gustavus, whose fortunes he followed throughout the Thirty Years' War, being present at the battle of Lützen (1632), where Gustavus was killed. In 1636 he succeeded Kniphausen as field marshal in the Swedish army. In 1638–41 Leven was lord general of the Scottish Covenanters in their struggles with Charles I. He was created Earl of Leven in 1641. When the Great Rebellion broke out in England, he commanded the Scottish troops that coöperated with the parliamentarian forces at the siege of York and at Marston Moor. Later when the Scots adopted the cause of Charles II, Leven was placed in chief command; but was defeated by Cromwell at Dunbar in 1650. He was captured by the English in 1651; was imprisoned in the Tower for a short time; was then paroled; and subsequently (1654) he regained full liberty.

LEVENE, le-vēn′, PHŒBUS AARON (THEODOR) (1869–). An American chemist. Born in Russia, he graduated M.D. in 1891 from the Imperial Military Medical Academy, St. Petersburg (now Petrograd), and thereafter studied at the universities of Bern, Marburg, Berlin, and Munich. In 1893 he came to the United States and was a special student at Columbia University. From 1896 to 1905 he served as associate chemist in the New York Pathological Institute, lectured on pathological chemistry at New York University in 1905–06, and was assistant in 1906–07 and chief after 1908 of the department of biological chemistry in the Rockefeller Institute. Levene is author of some 150 monographs, dealing especially with the subject of nutrition, and he contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA.

LEVENSHULME, lēv″nz-hūlm. A manufacturing town in Lancashire, England, 3½ miles southeast of Manchester. Pop., 1901, 11,500; 1911, 19,527.

LÉVÊQUE, lā′vâk′, JEAN CHARLES (1818–1900). A French philosopher, born at Bordeaux. He was a pupil of the Normal School, taught at Besançon, and studied in Athens (1847–48). After his return to France he taught at Toulouse, Besançon, and Nancy. He was appointed to the chair of Latin and Greek philosophy at the Collège de France in 1856 and in 1865 became a member of the Académie des Sciences Morales et Politiques, of which he was vice president in 1873. In philosophy he was a pupil of Cousin. His works include: *Le physique d'Aristote et la science contemporaine* (1860); *La science du beau, ses principes, ses applications, son histoire* (1872); *Études de philosophie grecque et latine* (1864); *Le spiritualisme dans l'art* (1864); *La science de l'invisible* (1865); *Les harmonies providentielles* (1872; 4th ed., 1885).

LEVER, lē′vẽr or lĕv′ẽr (OF. *leveor, leveur,* Fr. *leveur,* lever, from Lat. *levator,* lifter, from *levare,* to raise). A form of machine much used in simple physical instruments. It consists essentially of a rigid body pivoted at one point. If the body is acted on by two forces (F_1 and F_2) in different directions, which hold it in equilibrium, the formula for the mechanical advantage can be deduced at once; the general principle being that since there is equilibrium the moment of one force around the pivot at P, i. e., F_1l_1, must equal the moment of the second force around the same axis, i.e., F_2l_2. The fixed point is called the fulcrum, and l_1 and l_2 the lever arms. Thus, to balance a force F_1 a force F_2 is necessary, where $F_1l_1 = F_2l_2$. The "mechanical advantage" is, therefore, l_1/l_2.



LEVER.

Another mode of deducing the same formula is to consider the system displaced slightly when in equilibrium under the forces F_1 and F_2. The point of application of F_1 will move a distance x_1; that of F_2, a distance x_2. By the principle of energy $F_1x_1 = F_2x_2$; but by geometry, if the displacement is small, $\frac{x_1}{l_1} = \frac{x_2}{l_2}$, and hence $F_1l_1 = F_2l_2$, as before.

In some levers the fulcrum lies between the two balancing forces, e.g., pump handle, crowbar, scissors. In other cases it lies beyond the forces, e.g., sugar tongs, nutcracker, claw hammer, a wheelbarrow. The principle of the simplest form of lever was stated by Archimedes, and the more general principle was given by Leonardo da Vinci. See MECHANICS.

LEVER, lē′vẽr or lĕv′ẽr, CHARLES JAMES (1806–72). An Irish novelist, born in Dublin, Aug. 31, 1806. He graduated B.A. from Trinity College, Dublin, in 1827 and then studied medicine at Göttingen, Germany. A visit to Canada in 1829 he subsequently turned to good use in *Arthur O'Leary* (1844) and *Con Cregan* (1849). Returning to Dublin, he took his medical degree at Trinity (1831) and received several appointments from the board of health. In the *Dublin University Magazine* for February, 1837, appeared the first installment of *Harry Lorrequer* (pub. 1839). This was followed by *Charles O'Malley* (1841) and *Jack Hinton* (1843). These first three novels of Irish life, boisterous extravaganzas of fun and youthful spirits, represent their author at his best and are the stories that keep his fame alive. The pictures they afford of the life and characters of their day and country are, however, distorted by Lever's constant tendency towards caricature and exaggeration. This did not, and does not, interfere with their being immensely popular and highly entertaining. The military novel *Tom Burke of Ours* (1844) has also had a wide vogue. Of the long list of his novels the following, in addition to those already named, may be mentioned as perhaps best repaying perusal: *The Knight of Gwynne* (1847); *The Confessions of Con Cregan* (1849); *Sir Jasper Carew* (1855); *The Martins of Cro' Martin* (1856); *Sir Brooke Fosbrooke* (1866). After *Tom Burke* Lever's work showed a quieter humor and spread into a social survey of the Ireland of his time. It is in his Irish stories that he is always most at home, though he was moderately successful in depicting English and continental life and character, as in *The Dodd Family Abroad* (1853–54). After editing the *Dublin University Magazine* from 1842 to 1845, Lever lived mostly abroad and gathered material for his fiction there. In 1857 he was appointed Consul at Spezia and 10 years later at Trieste, where he died June 1, 1872. His *Works* were published by Routledge (33 vols., London, 1876–78; since reprinted), and in the Barrington edition (32 vols., Boston, 1902). Consult his *Life* by Fitzpatrick (London, 1879), and H. S. Krans, *Irish Life in Irish Fiction* (New York and London, 1903).

LEV′ERET (OF. *levret*, dim. of *levre*, Fr. *lièvre*, It. *lepre*, hare, from Lat. *lepus*, hare). The young of the hare during the first year of its age. See Hare.

LEV′ERETT, John (1616–79). An American Colonial official. He came to Boston with his father in 1633 from Boston Parish, England, but went back to serve in the Parliamentary army in 1644. He was a captain under Cromwell, who became his friend. On his return to Boston he was a member of the General Court (1651–52) and was sent to bring Maine under the jurisdiction of Massachusetts. He also took part in the capture of settlements along the St. Lawrence. In 1666 he went to England to represent the Colony and remained six years. On his return he was made Speaker of the General Court and major general of the militia. For six years he was in the Governor's Council and was then made Deputy Governor. When Bellingham died in 1672, he filled out his term. He was regularly elected Governor in 1673 and died in office. Consult the *Report of the New England Genealogical Society* for 1881.

LEVERRIER, le-vĕr′yȧ′, Urbain Jean Joseph (1811–77). A French astronomer, born at Saint-Lô. He was admitted to the Ecole Polytechnique in 1831 and was subsequently employed for some time as an engineer in connection with the government tobacco monopoly. His *Tables de Mercure* and several memoirs on "the secular inequalities" opened to him the door of the Academy in 1846. At the instance of Arago he applied himself to the examination of the disturbances in the motions of the planets, from which the existence of an undiscovered planet could be inferred, and, as the result of his laborious calculations, directed the attention of astronomers to the point in the heavens where, a few days afterward, the planet Neptune was actually discovered. The elements of the orbit of the planet had also been calculated by the English astronomer Adams in 1845, but no search was made for the planet. For this Leverrier was rewarded with the Grand Cross of the Legion of Honor, a professorship of astronomy in the Faculty of Sciences at Paris, and various minor honors. In 1854 Leverrier was appointed to the directorship of the Observatory of Paris, an office which, save during an interval of three years (1870–72), he held till his death. See Adams, John Couch; Neptune.

LEVERTIN, lĕv′ĕr-tēn′, Oscar Ivar (1862–1906). A Swedish critic, novelist, and poet, born near Norrköping, of Hebrew descent. He was educated at Upsala, where he obtained the doctorate (1888), became docent in literature there in 1889, and was appointed professor at Stockholm in 1899. His well-written critical works include: *Teater och drama under Gustaf III* (1889), *Gustaf III som dramatisk författare* (1894), *Från Gustaf III's dagar* (1896), *Svenska gestalter* (1903), and (an art monograph) *Niclas Lafrensen* (1899). At first a Realist, he wrote the novels *Småmynt* (1883) and *Konflikter* (1885); later, turning Romanticist, he published the collections of poems *Legender och visor* (1891), *Nya dikter* (1894), *Dikter* (1902), and *Kung Salomo och Morolf* (1905). Among novels of this period were *Lifvets fiender* (1891), *Rococonoveller* (1899), and *Sista Noveller* (1906). His *Samlade skrifter* were published (1907–14) in 30 volumes.

LE′VERWOOD. A synonym for ironwood. See Hornbeam.

LEVESON-GOWER, lo͞o′son-gōr′, Granville George. See Granville, second Earl.

LEVETZOW, lā′vet-sō, Ulrike, Baroness von (1804–99). A friend of Goethe. She met him at Marienbad and Karlsbad in 1822 and 1823, when she was 18 and he was 73. The poet was so carried away with her wit and beauty that he thought for a time of marrying her and addressed to her the poems which he afterward called *Trilogie der Leidenschaft*. Consult Suphan, *Goethe Jahrbuch*, vol. xxi (Frankfort, 1900), and Kirschoer, *Erinnerungen an Goethes Ulrike und an die Familie von Levetzow-Rauch* (Aussig, 1904).

LE′VI (Heb. *Lēwi*, probably a Gentilic form, possibly connected with *lāwah*, to join; Minæan *lawa*, fem. *lawat*, one attached to a sanctuary, priest, priestess). According to the Book of Genesis, the third son of Jacob and Leah (Gen. xxix. 34), eponymous ancestor of the Levites (q.v.). With his brother Simeon he is reported to have treacherously slaughtered the Shechemites for their outrage on his sister Dinah, an act for which Jacob administered a reproof (Gen. xxxiv) and even on his deathbed cursed Simeon and Levi, saying they should be scattered in Israel (Gen. xlix. 5–7). This curse is probably a reminiscence of tribal quarrels and refers to events which occurred after the entry of the Hebrews into Canaan. That both these tribes were practically wiped out appears to follow from the circumstance that Simeon occupies territory in Judah (Josh. xix. 1–9), while Levi has no territory at all. Neither of them plays any part in the political history of Israel or Judah. The remnant of Levi seems to have devoted itself to priestly functions, for which its special zeal for Yahwe at Kadesh Barnea appears to have fitted its members. (See Levite.) On the early Arabic term *lawa*, *lawat*, for priest, priestess, consult Mordtmann, *Beiträge zur minäischen Epigraphik* (Vienna, 1897); and Ed. Meyer, *Die Israeliten* (Halle, 1906).

LEVI, lā′vė, Hermann (1839–1900). A noted German conductor, one of the first and most influential exponents of Wagner, born at Giessen. From 1852 to 1855 he was a pupil of V. Lachner in Mannheim and then for three years of the Leipzig Conservatory. He began his career in 1859 as conductor in Saarbrücken.

From 1861 to 1864 he conducted the German operas at Rotterdam. Then he became court conductor at Karlsruhe and in 1872 was called to Munich. In 1882 he was chosen by Wagner to direct the first performance of *Parsifal*. An incurable affection of the brain necessitated his resignation in 1896. He died in Munich. As a composer, he became known through a concerto for piano and a number of songs. He also produced excellent translations of several opera librettos (Mozart, Berlioz, Chabrier).

LEVI, Leone (1821–88). An English economist, born in Ancona, Italy, of Jewish parentage. In 1884 he removed to Liverpool, where he was naturalized as a British citizen. A few notes to one of the Liverpool papers upon chambers of commerce and commercial tribunals led to the founding of such organizations in several of the leading cities. Levi became honorary secretary of the Liverpool Chamber of Commerce and was active in efforts for the improvement of the commercial law. His work on Commercial Law (1850–52) led to the creation of a royal commission and many important amendments. In 1852 Levi was appointed professor of commerce at King's College, London. He was an active participant in the work of the Statistical Society, the Law Amendment Society, and kindred organizations. His principal work was his *History of British Commerce and of the Economic Progress of the British Nation 1763–1870* (London, 1872). He died May 7, 1888.

LÉVI, lā'vē', Sylvain (1863–). A distinguished French Orientalist of Jewish descent. His interest in India was developed at an early age, and in 1886 he was appointed instructor in Sanskrit at the Ecole des Hautes Etudes. In 1890 Lévi received the degree of docteur ès lettres, for which his Latin thesis was *Quid de Græcis Veterum Indorum Monumenta Tradiderint*. The same year he published his French thesis on the Sanskrit drama (*Le théâtre indien*), which remains a standard. In 1894 he was appointed full professor in Sanskrit at the Collège de France. He also wrote *La doctrine du sacrifice dans les Brâhmanas* (1898); "Les Jâtakas; étapes du Bouddha sur la voie des transmigrations," in the *Annales du Musée Guimet*, vol. xix (Paris, 1906); "Mahâyâna-Sûtrâlamkâra," in the *Bibliothèque de l'Ecole des Hautes Etudes*, vol. clix (ib., 1907); "Le Népal: étude historique d'un royaume hindou," in the *Annales du Musée Guimet*, vols. xvii–xix (3 vols., ib., 1905–08); "Açvaghosa, le Sûtrâlamkâra et ses sources," in the *Journal asiatique*, vol. xii (ib., 1908); and *L'Apramâda-varga, étude sur les récensions des Dharmapadas* (ib., 1912). On Jan. 29, 1911, his pupils presented to him a volume of *Mélanges d'indianisme* on the anniversary of his twenty-fifth year as a professor in the Ecole des Hautes Etudes.

LE'VI, Son of Alphæus. See Matthew.

LEVI'ATHAN (Heb. *liwyāthān*). A monster mentioned several times in the Old Testament. The word is used both in a specific and a general sense. As a specific term (Ps. lxxiv. 14), it signifies the crocodile; but it is also used in a wider sense, as a kind of cloud snake which darkens the heavens (Isa. xxvii. 1), a large sea monster of uncertain kind (Ps. civ. 26), and as monster, or dragon, in an entirely general sense (Job iii. 8, Hebrew text; cf. Revised Version and Authorized Version, marginal reading); the description in Job xli. 1 also seems to indicate something more than a mere crocodile. (Cf. Schmidt, *Messages of the Poets*, New York, 1911.) As a mythical monster, the Leviathan appears also under various names such as *Rahab* and *Behemoth*, and it has been plausibly demonstrated by Gunkel (*Schöpfung und Chaos*, Göttingen, 1895) that the conception is allied to that of Tiamat, the dragon who in the Babylonian creation story is overcome by the god Marduk. Gunkel has proposed the theory that the Leviathan represented originally a mythological monster, fought with and overcome by Yahwe. The dragon which plays so prominent a part in the Apocalyptic literature of the New Testament and also appears in "Bel and the Dragon," a deuterocanonical addition to the Book of Daniel, reverts to the conceptions connected with Leviathan and Tiamat.

LEVIATHAN, The, or The Matter, Form, and Power of a Commonwealth, Ecclesiastical and Civil. A philosophical treatise by Thomas Hobbes (1651). It embodies Hobbes's views of politics, which he claimed emerged from primitive anarchy to their complete form in monarchy The idea of absolutism here advocated is Hobbes's most celebrated speculation.

LEVIATHAN OF LITERATURE, The. A title given to Dr. Samuel Johnson.

LEVIEN, lā'vēn', Ilse (1852–1908). A German novelist and lyric poet, whose pseudonym was Ilse Frapan. She was born at Hamburg and was for many years a teacher. In 1884 she went to Stuttgart to study æsthetics and was an intimate friend of Vischer for the last four years of his life. She wrote *Vischer-Erinnerungen* in 1889. Then she spent two years (1889–90) at Munich and was a member of Paul Heyse's literary circle. She married an Armenian by the name of Okuniam. Incurably ill, she was shot by her friend Emma Mandelbaum, who then shot herself. Her publications include: *Hamburger Novellen* (1886); *Zwischen Elbe und Alster* (1890); *Bittersüss* (1891); *Querköpfe* (1895); *Vom ewig Neuen* (1896); *In der Stille* (1897); the volume of poems, *Gedichte* (1891); *Die Betrogenen* (1898); *Phibje Ohrtens Glück* (1902), a comedy; *Arbeit* (1903), a novel; *Jugendzeit* (1904), a tale; *Die Retter der Moral* (1905), a drama; *Erich Hetebrink* (1907), a novel. Consult H. Spiero, in *Deutsche Geister* (Leipzig, 1910).

LEVIN, lā-vēn', Rahel. See Varnhagen von Ense, Rahel Levin.

LEV'IRATE MARRIAGE (from Lat. *levir*, Gk. *δαήρ*, *daēr*, Skt. *dēvara*, AS. *tācor*, OHG. *zeihhur*, husband's brother). The marriage of a man to the widow of his deceased brother. This was an ancient usage widely prevalent at certain stages of civilization and rests ultimately upon the circumstance that the wife as the property of a man passed at his death with his estate to his heir, upon whom the obligation rested to provide for the widow and her children, or, if there were no children, to secure issue. Gen. xxxviii is an example of this usage. The ancient custom is carried over into the Deuteronomic Code (Deut. xxv. 5–10), where provision is made that a man must marry his deceased brother's widow in case no son is born of the first marriage. However, certain modifications are introduced which indicate a departure from the earlier custom. The obligation rested on a surviving brother only in case he "dwelled together" (i.e., on the family estate) with the deceased; and while formerly all the male offspring of the second marriage were regarded as the issue of the deceased, according to Deuteronomy only the eldest son of the new marriage was to be so considered. It appears also that, even with these modifications, the custom was falling into disuse, for the Deuteronomic Code provides a ceremony whereby a surviving brother can evade the obligation, though in doing so he is subjected to an insult by the widow, who draws off her brother-in-law's sandal and spits in his face. The situation in the postexilic Book of Ruth implies this custom, though still further modified. The brother of Elimelech upon whom rested the obligation to marry Naomi forfeits the privilege and also the duty to redeem the field which Naomi was forced to sell, but there is no longer connected with the formal repudiation any such ceremony of public obloquy as is prescribed in Deuteronomy. In Lev. xviii. 16; xx. 21, marriage with a deceased brother's wife is forbidden without qualification and evidently because of economic abuses to which the ancient custom led with advancing social culture. The contradiction between Deuteronomy and Leviticus was embarrassing to the Jewish rabbis. In the days of Jesus the levirate law was still observed in certain circles, but the Talmud effects a compromise by recognizing the validity of the prohibition in Leviticus, but insisting upon the performance of the ceremony prescribed in Deuteronomy, which is still observed among orthodox Jews. Consult Nowack, *Hebräische Archäologie* (Freiburg, 1894), and Benzinger, *Hebräische Archäologie* (2d ed., Tübingen, 1907).

LEVIS, lē'vĭs; *Fr. pron.* lå'vē', or Point Levi. A town and the capital of Levis Co., Quebec, Canada, on the south bank of the St. Lawrence River, opposite the city of Quebec, and on the Quebec Central, the Grand Trunk, and the Intercolonial railroads (Map: Quebec, G 4). Steam ferries run to the city of Quebec. It has excellent docking facilities. Among the public buildings and institutions are a classical college, Roman Catholic convents, and hospitals. Manufacturing establishments include a shipyard, tanning, knitting, boot and shoe, wax-taper, and cigar factories, a saw mill, a foundry, and machine shops. Levis is protected by fortifications crowning the heights from which General Monckton bombarded Quebec in 1759. Pop., 1901, 7783; 1911, 7452.

LÉVIS, lå'vē', François Gaston, Duke of (1720–87). A French soldier, born at Château d'Ajac, Languedoc. After serving with distinction in the army in Bohemia, Germany, and Italy during the War of the Austrian Succession, he was sent to Canada (1756), where he was second to Montcalm in the campaigns against the British. He was promoted major general for his leading share in the successful defense of Carillon (1758) against a far superior force of English. He repulsed General Wolfe at Montmorency (1759) and after the death of Montcalm took command of the remnants of the French army. He kept up a hopeless but gallant fight against the conquering British for two years. In the battle of Sainte Foy (1760) he won a victory over them that would have resulted in Quebec changing hands once more had the French instead of the English ships arrived with the opening of navigation. After his return to France Lévis was made lieutenant general in 1761, served in the Rhine campaigns, was with Condé at the victory of Johannisburg, and became Governor of Artois in 1765, a marshal of France in 1783, and Duke in 1784.

LEVI'TA, Elias, or Elia Levi ben Asher, surnamed Ashkenazi, the German; Ha-bachur, the Master; and Ha-medakdek, the Grammarian (c.1468–1549). A Jewish grammarian and exegete. He was born at Neustadt-on-the-Aisch, near Nuremberg, about 1468. In 1496 he went to Italy, where he taught Hebrew mainly, if not solely, to Christians. He first taught in Venice, then in Padua, and next in Rome, where he had Cardinal Egidio as a pupil. From Rome he returned to Venice, and here he gave lessons to the French Ambassador, George de Silve; then he went to Isny, in Swabia, and finally returned to Venice. No Jews were allowed to live in France at this time, but Elias Levita received the unique honor of an invitation—which he declined—from King Francis I to come to France and teach the Hebrew language. He died in Venice in 1549. His principal works are a Hebrew grammar, entitled *Bahur* (1518); a treatise on the Masora, *Masoreth ha-Masoreth* (1538), important for the study of the Hebrew text of the Old Testament; and a dictionary of the Targum, *Meturgeman* (1541). His book, *Tishbi* (1541), a compilation of 712 articles treating chiefly of Rabbinic Hebrew, and his *Tub Taam*, a treatise on accents in biblical Hebrew, also deserve mention. Elias Levita's Hebrew knowledge was derived mainly from the works of the *Kimchis* (q.v.).

LE'VITE (Lat. *Levites*, Gk. Λευίτης, *Leuites*, from Heb. *Lēwi*, possibly connected with the S. Ar. *lawa'*, priest or temple attendant, fem. *lawa't*, priestess). The designation in the Pentateuch for servitors attached to the sanctuary of Yahwe. The usage of the term Levite in different parts of the Pentateuch differs in an important particular. In Deuteronomy the priests are referred to as "the Levite priests," a distinction between priest and Levite being apparently unknown at the time of the introduction of this code (c.620 B.C.). Ezekiel, however, makes a distinction between priests of the family of Zadok, who presided over the temple from the days of Solomon, and Levites (chaps. xliii–xlv). By Levites are meant the former priests of the sanctuaries (or high places) in Israel and Judah, which by the Deuteronomic Code had been abrogated in order to make possible the centralization of the cult in the temple at Jerusalem. These Levites, as a punishment for maintaining a cult that to the later writers appeared idolatrous, were to be degraded to the position of temple servants, subordinate to the Zadokites. This distinction seems to be fully carried out in Leviticus and Numbers. A compromise is effected between the priests of Jerusalem and those who served in the other sanctuaries by recognizing the descent of all from an eponymous ancestor, Levi; but, on the other hand, within this tribe special prerogatives are accorded to a particular family—that of Aaron, to whose hands the priesthood proper is intrusted. This did not involve the setting aside of the privileges of the Zadokites, whose descent was reckoned from Aaron through the latter's son Eleazar (1 Chron. xxiv. 3), while removing any opprobrium attached to the Levites by emphasizing a common origin with the priests. It is evident, from a consideration of this development in the use of the term Levite, that it originally designated a priest. (See Levi.) This seems to be the meaning also of the Minæan word *lawa'* (fem. *lawa't*) found in three inscriptions from El Oela. The connection of Levite as priest with the tribe of Levi goes back to very early times. A Levite is engaged as priest by Micah in his sanctuary on Mount Ephraim (Judg. xix–xxi). The ancient tribe of Levi, as we see from Gen. xlix. 5, was warlike, and the story of the treacherous attack of Simeon and Levi upon Shechem (Gen. xxxiv) is thought by some scholars to be an illustration of the secular character of this tribe and also an indication of its having been practically annihilated. But a violent zeal for Yahwe is not inconsistent with the essentially priestly character of the clan, and the destruction is likely to be only partial. Some historians think that the Levites were originally settled in and around Kadesh Barnea (q.v.). (See MOSES.) The Levites and their neighbors, the Simeonites, seem to have been driven out of their home in the Negeb by the Jerahmeelites. (See JERAHMEEL.) An attempt to settle farther north, similar to that of the Danites, appears to have failed. Simeon was in part absorbed in Judah (q.v.). Some remnants of Levi became attached to sanctuaries as guardians or priests. Gradually all priests were traced back to Levi, and the tribe as a whole was regarded as consecrated to the service of Yahwe as a substitute for the offering of the first-born in each Israelitish family, who rightfully belonged to the deity (Num. iii. 12). As servants of the sanctuary, supported by the temple income, the Levites were not obliged to cultivate the land and hence owned no territory. An exemption was made in respect to the cities of refuge, which were assigned to the priests, but which were merely old sanctuaries recognized as sacred asylums to which murderers fled from the avenger of blood (q.v.).

The duties of the Levites are specified in various parts of the Pentateuch (q.v.) and elaborated in the books of Chronicles. They were not properly servants of Yahwe, but servants to the Aaronite priests to whom they were "given." They were not permitted to approach the inner sanctuary. They had charge of the sacred vessels and prepared the animal for the sacrifice. Menial duties, such as the cleaning of the vessels and of the temple halls, were also imposed on them, as well as "watch" duties. According to Leviticus, one-tenth of the tithes only belonged to the Levites; but it would appear from the Book of Nehemiah that their income in fact was larger. Not all of the provisions, it must be borne in mind, were carried out; and, on the whole, the position of the Levites, who so far outnumbered the priests proper, was evidently better than the Pentateuch would lead us to suppose.

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LEVIT'ICUS (Lat. Leviticus, Gk. *Λευιτικόν*, *Leuiticon*, pertaining to the Levites, from *Λευίτης*, *Leuites*). The name of the third book of the Pentateuch, derived from the title given to it in the Greek translation, "the Levitical book," as treating chiefly of the functions of the Levites, the term Levitical being used as synonymous with "sacerdotal." Like Exodus and Numbers, however, it contains also historical material and is viewed by many critics as part of a great historical compilation in which the legal codes have been inserted at the point at which, according to the historical theory underlying the Pentateuch (q.v.), they were promulgated. Leviticus may be divided into the following sections: (1) the Sacrificial Code, i–vii; (2) the story of the consecration of priests, viii–x; (3) the Purification Code, xi–xv; (4) the ritual for the Day of Atonement, xvi; (5) the Holiness Code, xvii–xxvi; (6) the Commutation Code, xxvii. Of these section (1) contains the laws concerning sacrifices systematically arranged with reference to (*a*) burnt offerings, (*b*) meal offerings, (*c*) peace offerings, (*d*) sin offerings, and (*e*) trespass offerings. To these are added a series of rules chiefly for the guidance of the priests, and some further specifications with regard to the various kinds of offerings. To the account of the consecration of priests in section (2) there have been added (chap. x) the stories of Nadab and Abihu, two sons of Aaron who incurred the wrath of Yahwe by carrying unhallowed fire in their censers, and of Eleazar and Ithamar, the sons of Aaron that were left, after their older brothers had been devoured by fire because of their ceremonial error, who likewise angered Yahwe by burning the goat of the sin offering instead of bringing the blood into the sanctuary and eating the flesh, but whose error was forgiven as a sin of ignorance. Section (3) deals with cleanness and uncleanness in general. The beginning is made with clean and unclean animals, which are enumerated in detail, with their distinguishing signs, and the consequences of defilement by contact with unclean animals and the carcasses of clean animals (chap. xi). In chap. xii uncleanness connected with childbirth is defined, and regulations for purification are given. Chap. xiii treats of skin diseases as causes of uncleanness, examination of signs pointing to leprosy, and discrimination between innocent eruptions and genuinely "unclean" symptoms. Chap. xiv makes application of the method to stuffs, cloth, leather, and to spots on the wall, and indicates methods of purification. Chap. xv deals with uncleanness resulting from sexual secretions and discharges in men and women. In section (4) the precautions are set forth which must be observed by the priests to prevent a misfortune like that related in chap. x. Incidentally to these prescriptions an old piacular ritual is introduced which involves the sending away of a scapegoat into the wilderness. This rite is carried over into the solemn celebration of the Atonement Day. Section (5), which has been called since Klostermann "the Holiness Code" because of the prominence attached in it to the "holy" character of the Jewish people, deals with the following topics: the slaughtering of domestic animals for offerings to Yahwe and prohibition against the eating of blood (xvii); laws against incest set forth in detail (xviii); miscellaneous commandments of a moral and social character (xix); prohibition of the Moloch cult and another law of incest (xx); regulations for priests, restrictions in regard to mourning and marriage, priests to be without physical blemish, ordinances with regard to the eating of sacrificial animals, which must also be without blemish (xxi–xxii); order and nature of festivals (xxiii); ordinances regarding oil for lamps in the tabernacle, shewbread, blasphemy, manslaughter, and torts (xxiv); Sabbatical year and Jubilee (xxv); the whole concluding with remarks of a hortatory character (xxvi). Section (6) deals with vows, estimations, and commutations on account of poverty.

It is evident that minor compendia of law have been united in this book. The Sacrificial Code (i–vii), the Purification Code (xi–xv), and the Holiness Code (xvii–xxvi) stand out prominently. But even these seem to represent a gradual growth. There are elements that are manifestly old, and others that have the appearance of being later accretions. Thus, in i–vii we find a group of instructions to priests which appear to embody relatively ancient practices with additions (vi. 8–vii. 2), while i. 1–vi. 7 seem to be supplements to the subject dealt with in this group of regulations. In general the distinctions between the different kinds of sacrifices and the manner of offering them are likely to go back to preëxilic times, though later additions may have been made. Again the regulations for taboos of food, persons, and objects clearly rest upon ancient customs which the Jews shared with surrounding nations, and even the formulation of the ordinances may be relatively old, though in their present form they seem to betray evidences of having passed through several editing stages. Many of the ordinances in the Holiness Code, particularly those in reference to the slaughter of animals, the lamps, and the shewbread, are unquestionably based on older customs and decisions, which, however, may have been elaborated and revised. This juxtaposition of old and new is especially noticeable in chap. xvi, where the ritual of the scapegoat, a survival of demon worship bearing on its face the mark of primitive conceptions of sin, is connected with the Atonement Day, of which no mention is made in codes that seem to be earlier than the exile, and which has the appearance of being distinctly a feature of postexilic Judaism. Editorial activity seems to be indicated by the separation of this chapter from chap. x, to which it alludes, by the Purification Code; by the introduction, after the Sacrificial Code, of a narrative recording how the priests were solemnly consecrated to offer them; and by the last chapter, which looks like a later addition. Chap. viii appears to belong to Exodus xl, while chap. ix is directly connected with Exodus xxv–xxix. A certain rearrangement seems to have taken place, involving the tearing apart of component pieces, and the desire to give an historical setting to the codes is manifest.

Modern critics were at first inclined to regard all the legislative material of this book as a part of a great corpus, embodying both legislation and narrative, which they called the Priests' Code. A distinction between the Holiness Code and the other ritual compendia was clearly seen by Klostermann and is now generally recognized. From a comparison of the Holiness Code with Ezekiel xl–xlviii (see EZEKIEL) and other sections of the Pentateuch, many scholars inferred that the former was written in the Exile, after the time of Ezekiel, but earlier than other parts of the Levitical legislation. Other students, however, maintained that it was wholly or substantially earlier than the exile. There is as yet no consensus of opinion in regard to this subject, but there is a tendency to admit that many parts of this code belong to the period of the Kingdom of Judah. Gradually the higher age of much of the material embodied in the other codes found in the Book of Leviticus is becoming recognized. The so-called Priests' Code is dissolving itself into fragments of different nature which cannot all be assigned to the same time, and there is a growing number of independent scholars who are no longer able to maintain the separate existence of such a code. Like the other books of the Pentateuch, Leviticus seems to have preserved to us many regulations that are much earlier than the estimate until recently prevalent among scholars would allow, while it also contains many late editions. See PENTATEUCH.

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LEVITOV, lĕ-vē′tôf, ALEXANDER IVANOVITCH (1835–77). A Russian writer of folk tales. He was born in the Government of Tombov and at eight helped his father, a country priest, conduct a parish school. Frequent jaunts in the adjacent steppes early gave him that love and knowledge of nature which characterize his tales. After an elementary education in a clerical school he went afoot to Moscow to enter the university, but harsh treatment at the hands of its officials caused him to leave. Going to St. Petersburg (also on foot), he entered a medical school in 1855. From there he was expelled for some indiscretion and exiled in the Far North, where, friendless and penniless, he took to drink—a habit which was never to be broken and which, after years of untold misery, brought on his untimely end.

Levitov's work largely reflects his own sad life. His themes are almost invariably the misery of poor folk in village, city, and town, prosaic, everyday adventures, with hardly any plots or intrigues. But there is such a note of sympathy and such an abundance of poetic color in his descriptions that his plotless tales make fascinating reading. Nor is there any trend or tendency about his characters—he has no heroes—to remind one of other writers of the underworld (Gorky, e.g.); his are purely impressionist sketches, in which what is told matters less than how it is told. Into the spiritual struggles of men and women this writer does not enter. Levitov's best-known collections of stories are *Sketches of the Steppe* (1865), written in exile and charmingly reminiscent of his childhood; *Moscow Dens and Slums* (1868), *The Sorrows of Country, Highway, and Town* (1874), a mixed collection of tales faithfully and lovingly depicting low life as the author knew it. The latest complete edition of his works (8 vols., St. Petersburg, 1911) contains a good biographical study and a complete bibliography.

LEVKAS, lĕf-kȧs′. See Amaxichi.

LEVKOSIA, lĕf-kō′sē-ȧ. Another name for Nicosia (q.v.).

LEV′ULOSE. See Sugars.

LEVY (Fr. *lever*, to raise). A body of men raised or collected for military purposes, usually by authority of the state. A *levy in mass* (Fr. *levée en masse*) is the assemblage of all citizens fit for military service. See Armies; Conscription; Recruitment.

LEVY (OF. *levee*, Fr. *levée*, a raising, embankment). In its legal sense, the seizure and taking possession of the property of a person, by a proper officer, under a writ or other process of law directing such action. It was formerly specifically used to designate the proceedings in connection with a fine (q.v.) of lands, but this has fallen into disuse. The most common employment of the term is to describe the act of a sheriff, marshal, or other officer, whereby he seizes the property of a judgment debtor under an execution (q.v.), or writ of fieri facias (q.v.), for the satisfaction of the judgment.

To constitute a valid levy the officer must take actual possession of the property. In case of personal property he should retain actual custody of it, either by locking it up or putting a deputy in charge of it; in case of real property he should enter and show by open and unequivocal acts that he has taken legal possession under his process, but in most states the judgment debtor is not ejected from the property, as his possession is subject to the levy and subsequent sale. In making a levy the officer does not act as the agent of the person in whose behalf it is made, but acquires an independent possession, as bailee, of the goods so levied on by him, and as such he is liable for any misuse thereof or for negligence resulting in its loss or injury.

The term "levy" is also applied to the seizure of property under a writ of attachment. The rules as to taking possession of the property of the person against whom such a writ is issued are similar to those under an execution against property. See Attachment; Execution; Sale; Sheriff; and consult the authorities there referred to.

LÉVY, Auguste Michel (1844–1911). A French geologist. He was born in Paris and was educated at the Ecole Polytechnique and at the Ecole des Mines. Attached after 1876 to the Geological Survey of France, he had a very important part in the development of this service. In 1896 he was elected a member of the Academy of Sciences. His publications include: *Structure des roches éruptives étudiées au microscope* (1876) and *L'Explication de la carte géologique de la France* (1879), with F. Fouqué; *Synthèse des minéraux et des roches* (1888) and *Tableaux des minéraux des roches* (1889), with A. Lacroix; *Structures et classification des roches éruptives* (1889).

LEVY, lā′vē, Jakob (1819–92). A Jewish Orientalist, born at Dobrzyze in Posen. He was educated at Breslau, in 1845 became rabbi at Rosenberg and in 1850 went to Breslau, where he taught (1871–75) in a Jewish school. In 1875 he was appointed professor in Breslau University. His principal works are *Chaldäisches Wörterbuch über die Targumim* (1867–68) and a *Neuhebräisches und chaldäisches Wörterbuch über die Talmudim und Midraschim* (1876–89).

LEVY, Louis Edward (1846–1919). An American photochemist, born at Stenowitz, Bohemia. Having come to the United States in childhood, in 1866 he made special studies at the University of Michigan. He investigated microscopic photography in 1869–70, invented photochemical engraving ("Levytype") in 1875, and founded the Levytype Company. In 1896, with his brother, Max Levy, he received the John Scott Legacy medal (Franklin Institute) for inventing the Levy line screen; and he was awarded the Elliott Cresson gold medal in 1900 for the invention of the acid blast and again in 1907 for his etch-powdering machine, and gold medals at the Paris Exposition (1900) and the St. Louis Exposition (1904). He is author of *The Jewish Year* (1895); *The Russian Jewish Refugees in America* (1895); *Business, Money, and Credit* (1896); *Cause of Business Depressions* (1914), with Hugo Bilgram.

LÉVY, Raphaël Georges (1853–). A French economist, born in Paris, where he was educated at the Lycée Louis-le-Grand and at the Ecole de Droit. After 1886 he turned his attention to the study of political economy and wrote widely for periodicals on laws of exchange, variations of national credits, economic crises, and like topics. He became professor of political economy at the Ecole Libre des Sciences Politiques and was elected in 1913 a member of the Académie des Sciences Morales et Politiques. His writings include: *Le péril financier* (1888); *La spéculation et la banque* (1893); *La vraie Amérique* (1894); *Les chemins de fer français* (1894); *Le monopole de l'alcool* (1897); *Les finances des Etats-Unis* (1898); *La dette anglais* (1898); *Le mouvement industriel* (1899); *Les finances égyptiennes* (1899); *Allemagne industrielle* (1901); *Finances de guerre: Russie et Japon* (1904); *Principes de monnaie de banque* (1905); *Banques d'émission et trésors publics* (1911).

LEWAL, le-vȧl′, Jules Louis (1823–1908). A French general. He was born in Paris, entered the army in 1846, participated in the Crimean War, served in the Italian campaign of 1859, with the French troops in Mexico (1862), and, after coöperation with Niel in the army reforms, in the Franco-Prussian War. He was promoted to brigadier in 1874, was head of the Military Academy (1877–80), in 1885 was Minister of War in Ferry's cabinet, and in 1888 was appointed inspector general. He wrote: *La réforme de l'armée* (1871); *Etudes de guerre* (1872, 1890); *Tactique* (1875–90); *Stratégie de marche* (1893); *Stratégie de combat* (1895 et seq.).

LEWALD, lā′vȧlt, August (1792–1871). A German author and theatre manager, born at Königsberg. He entered the Russian service at Warsaw, as Secretary, during the War of Liberation. He became an actor, and after 1818 he was manager and director of theatres at Hamburg, Stuttgart, and elsewhere. In 1835 he founded at Stuttgart the periodical *Europa*, which he conducted till 1846, and afterward became editor of the conservative *Deutsche Chronik*. A collection of his works, made by himself, was published in 12 volumes (1843–45), including the autobiographical *Aquarelle aus dem Leben* (1836–37 and 1840). Consult K. Gutzkow, in *Oeffentliche Charaktere* (Hamburg, 1835).

LEWALD, Fanny (1811–89). A German novelist and essayist, a cousin of August Lewald. She was born in Königsberg, of Jewish parents, but joined the Protestant church when she was sixteen. Travel developed her powers of composition, and in 1841 she published her first novel in *Europa*, under the title *Der Stellvertreter.* Four years later, after travels in Italy, she settled in Berlin, where she married Adolph Stahr (q.v.) in 1855. She wrote many novels and stories, among which may be mentioned: *Klementine* (1842); *Jenny* (1843); *Nella* (1870); *Die Erlöserin* (1873); *Neue Novellen* (1877); *Stella*, which has been translated into English (1884); *Die Familie Darner* (Berlin, 1888); *12 Bilder aus dem Leben* (Berlin, 1888). Her novels are characterized by close observation and hard realism. She also wrote sketches of travel and the autobiographical *Meine Lebensgeschichte* (1861–63); and, treating the question of woman's rights, of which she was an ardent supporter, *Osterbriefe für die Frauen* (1863) and *Für und wider die Frauen* (2d ed., 1875). Consult Frenzel, *Erinnerungen und Strömungen* (Leipzig, 1890), and G. Jansen, *Karl Alex. von Sachsen-Weimar in seinen Briefen an Fanny Lewald* (Berlin, 1904).

LEWCHEW, LEWKEW. See LUCHU.

LEWENHAUPT, lā′ven-houpt, ADAM LUDVIG (1659–1719). A Swedish general. He was born in a Swedish military camp near Copenhagen; studied at Upsala, Lund, Rostock, and Wittenberg; served in the Austrian army against the Turks, and under William III in Holland against the French; and in 1697 returned to Sweden. In the war waged by Charles XII against Peter the Great and his allies he was intrusted with the defense of Courland, and defeated the enemy in several engagements (1703–05). Lewenhaupt fought bravely at Poltava in 1709, and after that disastrous battle was forced to surrender the remnant of the Swedish forces to the Russians. He was for some time kept a prisoner in Russia, and during this period, after the death of Charles XII, he was made Swedish Councilor of State, but died before he could reach home to accept the office. His memoirs, edited by his son-in-law, were published at Stockholm in 1757.

LEWES, lū′ĭs. The capital of Sussex, England, on the Ouse, 50 miles south of London, and 7 miles from Newhaven, its port (Map: England, F 6). It contains the ruins of a Cluniac priory founded in 1078 by Gundrada, stepdaughter of William the Conqueror, whose body is still preserved in a chapel of the old Norman church of St. John's Southover. A free grammar school was founded and endowed in 1512. It has also a school of science and art, a free library, a county hall, and a town hall. There are large annual sheep fairs. The Norman castle still stands and the well-preserved keep houses a small museum. The finest modern building is the Fitzroy Memorial Library, designed by Sir Gilbert Scott. Near Mount Harry-on-the-Downs occurred the battle of Lewes, in which Henry III was defeated (May 14, 1264) by the insurgent barons under Simon de Montfort. Lewes is of remote origin. Roman coins have been discovered in the neighborhood, and there are traces of ancient mounds. It was a royal demesne of the South Saxon rulers, and mints were established there by Athelstan. Pop., 1901, 11,249; 1911, 10,972. Consult: Horsfield, *History of Lewes* (2 vols., Lewes, 1824–27); Mantell, *The Ancient Town of Lewes* (London, 1846); *Victoria History of the County of Sussex*, vol. ii (ib., 1907).

LEWES. A city in Sussex Co., Del., on Delaware Bay, 42 miles southeast of Dover, on the Maryland, Delaware, and Virginia and the Pennsylvania railroads, and on the Lewes on Assowoman Canal (Map: Delaware, J 3). It has a good harbor, artificially secured by a stone breakwater; is the headquarters of the Delaware Bay pilots; and exports large quantities of vegetables, fish oils, and fruit to Northern markets. There are tin-box factories, a shirt factory, and several tomato canneries. Among the interesting features of the place are the Cape Henlopen Lighthouse, built in 1800, the Federal building, and the sand dunes, 3 miles long. The water works are owned by the city. Pop., 1910, 2158.

LEWES, GEORGE HENRY (1817–78). An English author. He was born in London, April 18, 1817, was educated at various schools, entered upon a commercial career, studied medicine, and finally resolved to devote himself to authorship. In his twenty-first year he proceeded to Germany, where he remained for two years, studying the life, language, literature, and philosophy of that country. On his return to England he took up his residence in London and began to write for the newspapers and magazines, till finally he became one of the most successful of littérateurs. Lewes edited with admirable talent the *Leader*, from 1850 to 1854; composed novels, comedies, and tragedies, and ultimately turned his active mind to the study of physiology and cognate branches of science, in which he won considerable repute. He married Agnes Jervis in 1840, but the union was unhappy and he separated from her in 1854 to live with Marian Evans (George Eliot) as man and wife. His principal works are: his *Biographical History of Philosophy from Thales to Comte* (1845), a new edition of which, much enlarged, was afterward published; *The Spanish Drama, Lope de Vega and Calderon* (1846); *Comte's Philosophy of the Sciences* (1853), a work which is not a mere translation of the French savant, but in several parts a complete remodeling; *Life and Works of Goethe* (1855); *Seaside Studies at Ilfracombe* (1858); *Physiology of Common Life* (1859); *Problems of Life and Mind* (1874–79); *On Actors and the Art of Acting* (1875). In 1865 Lewes founded the *Fortnightly Review*, and for a time was its editor. He died Nov. 30, 1878. In philosophy he leaned towards positivism (q.v.), but he developed his views with considerable originality. His *History* was written to prove the unattainability of metaphysical truth, although in his later writings he admitted the possibility of an empirical metaphysics. Consult the *New Quarterly* (London, October, 1879), and J. W. Cross, *George Eliot's Life as Related in her Letters and Journals* (3 vols., New York, 1885).

LEWES, MISE OF. See MISE OF LEWES.

LEWIN, lȧ-vēn′, GEORG RICHARD (1820–96). A German physician, born at Sondershausen. He studied medicine in Berlin, Halle, Leipzig, Heidelberg, Vienna, and Paris. After several years of charitable work he was made professor of dermatology at Berlin in 1868. He was best known for his novel treatment of laryngitis and of syphilis, as set forth in *Die Inhalationstherapie in Krankheiten der Respirationsorgane* (2d ed., 1865) and *Die Behandlung der Syphilis durch subkutane Sublimatinjektion* (1869).

LEWIN, lū′ĭn, THOMAS (1805–77). An English lawyer and biblical scholar. He was educated at Trinity College, Oxford; admitted to the bar in 1833, and in 1852 became conveyancing counsel to the Court of Chancery, and held the office the rest of his life. He wrote a standard treatise on *The Law of Trusts* (1837; 8th ed., 1885), but most of his works are of a religious character. Among them are: *The Life and Epistles of Saint Paul* (1851; 5th ed., 1890); an *Essay on the Chronology of the New Testament* (1854); *Jerusalem, A Sketch of the City and Temple from the Earliest Times to the Siege by Titus* (1861); *Siege of Jerusalem by Titus* (1863); and *Fasti Sacri, or a Key to the Chronology of the New Testament* (1868). He also published a work on Cæsar's invasion of Britain (1859; 2d ed., 1862).

LEWIS, or Lewis Fork. The old name of Snake River (q.v.).

LEWIS, lū′ĭs, Abram Herbart (1836–1908). An American clergyman of the Seventh-Day Baptist denomination. Born at Scott, N. Y., he studied at Milton College (Wisconsin), Alfred University (New York), and Union Theological Seminary. He held charges in Westerly, R. I. (1864–67); in New York (1868); and in Plainfield, N. J. (1880); became professor of Church history at Alfred University in 1868; and wrote: *Critical History of the Sabbath and the Sunday in the Christian Church* (1886; 2d ed., 1903); *Sunday Legislation* (1888; new ed., 1902); *Paganism Surviving in Christianity* (1890); *Swift Decadence of Sunday* (1899); *Spiritual Sabbathism* (1910).

LEWIS, Agnes Smith (?–). An English Orientalist, daughter of John Smith, a Scottish jurist of Irvine, Ayrshire, where she was born about the middle of the nineteenth century. She was educated at the Irvine school until 12 years of age, then at Birkenhead and London in private schools and by tutors. She became especially proficient in modern Greek, Arabic, and Syriac. Before her marriage in 1887 to the Rev. Samuel Savage Lewis (1836–91), fellow of Corpus Christi College, Cambridge, she wrote a number of novels and accounts of travel, among the latter *Glimpses of Greek Life and Scenery* and *Through Cyprus*. With her twin sister, Mrs. Margaret Dunlop Gibson (q.v.), she discovered, in 1892, in the library of the convent of St. Catherine on Mount Sinai, the palimpsest containing the Four Gospels in Syriac, representing the oldest text yet known of any part of the New Testament, probably as it existed in the second half of the second century A.D. In 1896 the sisters brought back the first leaf of the Hebrew Ecclesiasticus (q.v.). Mrs. Lewis received honorary degrees from Halle, Wittenberg, St. Andrews, Heidelberg, and Dublin. She and Mrs. Gibson gave the site for Westminster Theological College, Cambridge, in 1897. Mrs. Lewis's works include: a biography of her husband (1892); an introduction to the edition by Bensly, Rendel Harris, and Burkitt of *The Four Gospels from the Sinaitic Palimpsest* (1894; revised by her as *The Old Syriac Gospels*, 1910); *In the Shadow of Sinai* (1898); *The Story of Aḥikar*, with Conybeare and Harris (1898, 2d ed., 1913); *A Palestinian Syriac Lectionary of the Gospels*, with Mrs. Gibson (1900); and several volumes in *Studia Sinaitica* and *Horæ Semiticæ*, published by herself and Mrs. Gibson.

LEWIS, Alfred Henry ("Dan Quin") (1858–1914). An American author and journalist, born in Cleveland. At 21 he was city attorney of Cleveland; later a cowboy in the Southwest, a lawyer in Kansas City, and a correspondent at Washington of the Chicago *Times* and then of the Hearst papers. For a time after 1898 he edited *The Verdict*, a political weekly published by Perry Belmont in New York. Lewis became best known by his "Wolfville" stories, the product of his acquaintance with the small frontier town. In the capacity of attorney he advised Harry K. Thaw (q.v.) in 1913 that no crime would be committed if Thaw effected his escape from Matteawan Insane Asylum. His writings include: *Sandburrs* (1900); *Wolfville Days* (1902); *Wolfville Nights* (1902); *The Black Lion Inn* (1903); *Peggy O'Neal* (1903); *The Sunset Trail* (1905); *Confessions of a Detective* (1906); *The Story of Paul Jones* (1906); *The Throwback* (1906); *When Men Grew Tall* (1907); *An American Patrician—Aaron Burr* (1908); *Wolfville Folks* (1908); *The Apaches of New York* (1912); *Faro Nell and her Friends* (1913); *Nation-Famous New York Murders* (1914).

LEWIS, Andrew (c.1720–80). An American soldier. He was born in Donegal, Ireland, but in 1732 his family emigrated to America and became the first white settlers within the limits of the present Augusta Co., Va. Lewis served as a major under Washington in the Ohio expedition of 1754, and under Braddock, with the same rank, in 1755. In 1756 he commanded the Sandy Creek expedition against the Indians, and two years later was captured by the French near Fort Duquesne and taken as a prisoner to Montreal. He was Virginia's commissioner in the treaty negotiations with the Indians at Fort Stanwix (Rome, N. Y.) in 1768, and in 1774 served as brigadier general in Lord Dunmore's War (q.v.), and as such commanded the Virginia troops at the battle of Point Pleasant (q.v.). He was a member for several years of the Virginia House of Burgesses, and in 1776 was appointed by Congress a brigadier general in the Continental army, and took part in the military operations against Lord Dunmore. Ill health compelled him to resign his commission in April, 1777, and he died three years later in Bedford Co., Va. His four brothers, Samuel, Thomas, William, and Charles, were also prominent in the history of Virginia.

LEWIS, Charlton Thomas (1834–1904). An American lawyer and lexicographer, born in West Chester, Pa. He graduated from Yale College in 1853. In 1854–56 he studied for the Methodist ministry; in 1857 he became professor of languages in the State Normal University, Bloomington, Ill.; and later (1860) was appointed professor of mathematics in Troy University (New York) and (1862) professor of Greek in the same institution. Three years afterward he gave up teaching and settled in New York City for the practice of law. He spent the year 1867–68 in Europe on account of ill health; on his return he became editor, with William Cullen Bryant, of the New York *Evening Post*. In 1871 he again resumed his law practice and became counsel for many corporations. In 1898–99 he lectured on insurance before Columbia, Cornell, and Harvard universities. Among the many subjects which engaged his attention was that of prison reform. His principal published works are: *Gnomon of the New Testament*, translated from the German of Bengel (1861); *History of Germany* (1870); *Harper's Latin Dictionary* (1879), in collaboration with Prof. Charles Short; *Latin Dictionary for Schools* (1886); *Elementary Latin Dictionary* (1890).

LEWIS, Dio (1823–86). An American physician, born at Auburn, N. Y. He studied at the Harvard Medical School and practiced for a time successively at Port Byron and Buffalo, N. Y. At Buffalo he published a monthly periodical, in which he advocated the hygienic value of diet and exercise. He introduced a system of light gymnastics for schools and private classes, and in 1863 founded in Boston a school for training teachers of physical culture. He removed to New York City about 1883. His principal publications are: *The New Gymnastics* (1862); *Weak Lungs and How to Make Them Strong* (1863); *Talks about People's Stomachs* (1870); *Our Girls* (1871); *Chats with Young Women* (1871); *Chastity* (1872); *Gypsies* (1881); *In a Nutshell* (1883).

LEWIS, Edmonia (1845–). An American sculptor. She was born in New York, of negro and Indian parentage. She received little instruction in sculpture, but attracted attention by exhibiting a bust of Colonel Shaw at Boston in 1865. In the same year she went to Rome to study, and after 1867 made her residence there. Among her works are the "Freedwoman"; a curious and somewhat repulsively realistic statue, the "Dying Cleopatra," exhibited at the Philadelphia Exposition of 1876; "Asleep"; "Marriage of Hiawatha"; "Madonna with the Infant Christ." Among her portrait busts in terra cotta are those of Longfellow, Charles Sumner, John Brown, and Abraham Lincoln, in the library of San José, Cal. Her work, which shows talent and imagination, is mostly in Europe.

LEWIS, Estelle Anna Blanche (Robinson) (1824–80). An American poet. She was born near Baltimore, Md., and was married to Sidney Lewis of Brooklyn, N. Y., in 1841. From that time she lived chiefly in Europe. Her first verses appeared in New York as *Records of the Heart* (1844). Her later poems include: *The Child of the Sea* (1848); *The Myths of the Minstrel* (1852); *Poems* (1866). She also wrote three tragedies, *Helémah, or the Fall of Montezuma* (1864); *Sappho of Lesbos* (1868); *The King's Stratagem* (1869). Of these *Sappho*, her best work, passed through seven editions, and after being translated into Greek was produced at Athens.

LEWIS, Exum Percival (1863–). An American physicist, born in Washington Co., N. C. He was educated at Columbian (now George Washington) University (B.S., 1888), where he was instructor in physics (1891–95), and at Johns Hopkins University (Ph.D., 1895). At the University of California he served as an instructor in physics (1895–96), assistant professor (1896–1902), associate professor (1902–08), and as professor after 1908. He was a member of the Crocker eclipse expedition to the South Seas in 1908. He edited *The Effect of a Magnetic Field on Radiation* (1900) and contributed the sections on light and wave motion in Duff's *Text-Book of Physics* (1908).

LEWIS, Francis (1713–1803). An American patriot. He was born in Llandaff, Wales, and was educated at Westminster. After a mercantile apprenticeship he brought over a cargo of goods to America in 1735; settled in New York in 1737, and became a prosperous merchant. During the French and Indian War he was agent for clothing the British troops, was at Oswego when that post was surrendered to Montcalm by Colonel Mercer in 1756, and was taken prisoner and carried to France. On his return to New York he gradually retired from active business. He was prominent among the Sons of Liberty; was a member of the Continental Congress in 1774–79, and signed the Declaration of Independence. In 1776 his house on Long Island was plundered by the British, his papers destroyed, and his wife taken prisoner. After much trouble she was finally exchanged. Consult Jenkins, "Morgan Lewis" (son of Francis Lewis), in *Lives of the Governors of the State of New York* (Auburn, 1851).

LEWIS, Sir George Cornewall (1806–63). An English statesman and author, eldest son of Sir T. F. Lewis, of Harpton Court, Radnorshire. He was born in London, April 21, 1806. He was educated at Eton and at Christ Church, Oxford, where he was distinguished for classics and mathematics. He became a barrister in 1831, and after acting on various commissions of inquiry, succeeded his father as poor-law commissioner (1839–47). He sat in Parliament for Herefordshire from 1847 to 1852, and became successively Secretary to the Indian Board of Control, Undersecretary of the Home Department, and Financial Secretary to the Treasury. Losing his seat in 1852, he accepted the editorship of the Edinburgh *Review* (1852–55). Elected to Parliament for the Radnor Boroughs in 1855, he became, under Palmerston, Chancellor of the Exchequer (1855–58), Home Secretary (1859–61), and Secretary of State for War (1861–63). He died April 13, 1863. He wrote numerous articles for the magazines, especially for the Edinburgh *Review*, and published about 20 books on a great variety of topics. Among them are: *The Use and Abuse of Political Terms* (1832); *Origin and Formation of the Romance Languages* (1835); *Local Disturbances in Ireland* (1836); *A Glossary of Provincial Words Used in Herefordshire* (1839); *The Government of Dependencies* (1841); an edition of the spurious *Fables of Babrius* (1846); *The Influence of Authority in Matters of Opinion* (1849); *The Method of Observations and Reasoning in Politics* (1852); an *Inquiry into the Credibility of Early Roman History* (1855), an attack on Niebuhr; *Astronomy of the Ancients* (1862); and a *Dialogue on the Best Form of Government* (1863). Several of these works displaying solid learning have been reprinted. Consult *Letters of G. C. Lewis*, edited by G. F. Lewis (London, 1870), and Walter Bagehot, *Biographical Studies*, edited by Hutton (ib., 1881).

LEWIS, Sir George Henry, Bart. (1833–1911). An English lawyer. He was educated at University College, London, was admitted to the English bar in 1856, and soon made his reputation by the prosecution of the directors of Overend and Gurney's Bank when that institution failed. He appeared in many other famous cases, including the Colin Campbell divorce case and the Tranby Croft baccarat scandal. He prepared Parnell's case for the *Times* Parliamentary Commission hearing, and discovered that Richard Piggott had forged the alleged Parnell letters. He was created Knight in 1893 and Baronet in 1902, and seven years later he retired.

LEWIS, Henry Carvill (1853–88). An American geologist, born in Philadelphia. He graduated at the University of Pennsylvania in 1873 and spent several years in graduate study. In 1879 he became connected with the Geological Survey of Pennsylvania and in 1884 he published a *Report on the Terminal Moraine in Pennsylvania and New York*. A year afterward he went to Europe to study glacial phenomena in England, Ireland, and Switzerland, and to take courses in petrology under Rosenbusch at Heidelberg. His early death broke off these researches, but their partial results were contributed to the British Association (1886–87). In 1880 he was made professor of mineralogy in the Philadelphia Academy of Natural Sciences, and three years afterward was made professor of geology at Haverford College; both these chairs he held until his death.

LEWIS, Ida (1841–1911). An American life-saver, born at Newport, R. I. By a special Act of Congress, in 1878 she became keeper of Lime Rock Lighthouse, Newport harbor, of which her father had been keeper for many years. Expert at the oar and in swimming, she saved 22 lives between 1867 and 1904, receiving medals from the United States government, the Humane Society of Massachusetts, and the Life Saving Benevolent Society of New York. Her boat, the *Rescue*, presented to her by the citizens of Newport, was exhibited at the Columbian Exposition, Chicago, in 1893. She was married to William H. Wilson in 1870, but lived with him only a short time, and is commonly known by her maiden name.

LEWIS, James (1840–96). An American comedian. He was born in Troy, N. Y., and made his first stage appearance there in 1858, playing Farmer Gammon in *The Writing on the Wall*. At the outbreak of the Civil War he was in the South, and narrowly escaped being detained there by the blockade. Subsequently he traveled much in the Middle West. His first appearance in New York City was in 1866, in the farce *Your Life's in Danger*, presented at the Olympic Theatre by Mrs. John Wood's company. Afterward he was very successful in Boston in the rôle of Dick Swiveller. In 1869 he became the leading comedian in Augustin Daly's company in New York City, and he retained this position during the remainder of his life. He was highly successful in almost every comedy part that he played.

LEWIS, James Hamilton (1866–). An American lawyer and legislator, born at Danville, Va. After attending Houghton College, he ran away from home and located at Savannah, Ga. Friends assisted him to enter the University of Virginia and complete his education. Returning to Savannah, he studied law and was admitted to the bar in 1884. Two years later he removed to Seattle, Wash., where he practiced law successfully. Being elected in 1886 to the Territorial Legislature, he assumed leadership of the Democratic party, but in 1890 he declined nomination for Congress. In 1892 he was defeated for Governor of the new State, and was also unsuccessful as candidate for United States Senator in 1894 and 1899. In 1896, however, he was elected Congressman at large from Washington, and, although he served only one term, he became prominent as author of the resolution for the recognition of Cuban independence. His State presented him as a "favorite son" for the nomination for Vice President in 1896, and he was again mentioned for this place at Kansas City in 1900. In 1903 he was a member of the Joint High Commission on Canadian and Alaskan Boundaries which deliberated at London. Also in 1903 he moved his residence to Chicago, where he was corporation counsel for the city in 1905–07. He was given the Democratic nomination for Governor in 1908, and, although defeated by Deneen, his vigorous campaign made him widely known. In 1913, by virtue of a compromise with the Republicans whereby that party was to have the short-term senatorship, he was elected to the United States Senate for a full term. As whip of the Democratic party, he supported the Wilson administration consistently.

LEWIS, John (1858–). A Canadian journalist. He was born and educated in Toronto, studied law, and in 1881 joined the staff of the Toronto *World*, and afterward at various times until 1892 was connected with the Winnipeg *Times* and with the *Daily Globe*, the *News*, the *World*, and the *Star* of Toronto. In 1892 he succeeded as leader writer on the *Globe* Edward Farrer (q.v.), for many years the ablest writer of the Canadian political press. Lewis left the *Globe* in 1903, joining the staff of the *World*, and later the *Star*, of which he was made editor in chief. He published: *British Diplomacy and Canada* (1907); *Democracy* (1908); *Life of George Brown* (1906), one of the best biographies in the "Makers of Canada Series."

LEWIS, John Frederick (1805–76). An English historical, genre, and animal painter in oil and water color. He was born in London. His first works were animal paintings, but after a journey through Germany and Italy he devoted himself to aquarelles, becoming a member of the Water-Color Society in 1829. The scope of his art was enlarged by a visit to Spain in 1832–34, during which he painted only Spanish genre. After this he resided in Paris and Rome, and in 1840 he went to Greece and Constantinople, afterward settling for 10 years in Egypt. In 1851 he returned to England, where his aquarelles were received with much enthusiasm. His "Frank Encampment in the Desert of Mount Sinai" (1842) was considered by Ruskin the finest thing of its kind since Veronese. In 1855 he was elected president of the Water-Color Society, but resigned in 1858 to devote himself to oil painting. His oil paintings, treating Oriental subjects, sustained his previous reputation, and in 1865 he was elected Academician. His paintings, especially the water colors, show brilliant though often glaring color, careful finish, and minute detail. Among his water colors are: "Halt in the Desert" (1855, South Kensington Museum); "Bull Fight at Seville" (1836); "Easter Day at Rome" (1840); the "Harem" (1851). His oils include a "Greeting in the Desert" (1856); "Door of a Café at Cairo" (1866, Royal Academy); "Edfou: Upper Egypt" (1860) and "The Courtyard of the Coptic Patriarch's House in Cairo" (1864), both in the Tate Gallery, London.

LEWIS, Matthew Gregory (1775–1818). An English romancer, nicknamed "Monk" Lewis. He was born in London, July 9, 1775. His father owned valuable estates in Jamaica. Lewis was sent to Westminster School and thence to Christ Church, Oxford. In 1792 he went to Weimar, where he saw Goethe and acquired a knowledge of contemporary German literature. In 1794 he was appointed attaché to the British Embassy at The Hague; and from 1796 to 1802 he was in Parliament. In 1798 he made the acquaintance of Sir Walter Scott, who, then unknown, was glad to contribute to his *Tales of Wonder* (1801). In 1816 he visited Byron at Geneva, and again the next year in Florence and Venice. On the death of his father (1812) he inherited the estate and slaves in the West Indies. On the homeward voyage from a second visit to Jamaica he died of yellow fever (May 14, 1818). Lewis won wide celebrity for his *Ambrosio, or the Monk* (1795), and was ever afterward known as "Monk" Lewis. It is a Gothic romance after the type of Ann Radcliffe's *Mysteries of Udolpho.* It contains, however, incidents taken from German romance, and thus becomes historically interesting as a thread connecting the literature of Germany and England. Owing to certain voluptuous passages, afterward suppressed, the sale of the book was enjoined by the Attorney-General. A Gothic melodrama entitled *The Castle Spectre,* brought out at Drury Lane in 1798, ran for 60 nights, and long continued popular. After his death appeared the *Journal of a West Indian Proprietor* (1834), which was praised by Coleridge. The *Monk* has been often reprinted, though not usually entire. A second romance, *The Bravo of Venice* (1804), is in Cassell's National Library; and *The Tales of Wonder* and the earlier *Tales of Terror* (1799) were reprinted in Morley's Universal Library (1887). Consult: *The Life and Correspondence of Lewis* (London, 1839); and for Lewis's relation to German literature, H. A. Beers, *History of English Romanticism in the Eighteenth Century* (New York, 1899); also Brandl, *S. T. Coleridge und die englische Romantik* (Berlin, 1886; trans. by Lady Eastlake, London, 1887). See ENGLISH LITERATURE.

LEWIS, MERIWETHER (1774–1809). An American explorer, born near Charlottesville, Va. He came of a well-known Virginia family, being a grandnephew of Fielding Lewis, who married a sister of George Washington, and inherited from his father a comfortable estate. At the time of the Whisky Rebellion in 1794 he gave up farming to join the forces which the government sent into western Pennsylvania, and at the close of the insurrection became an ensign in the regular army. Five years later he was promoted to the rank of captain and in 1801 became President Jefferson's private secretary. When in 1803 it was decided to send an exploring expedition into the Louisiana country, for which the United States was then negotiating with France, the President accepted the promptly offered services of his secretary. Lewis chose as his companion Capt. William Clark (q.v.), an old army friend. The party left the Mississippi in May, 1804, and proceeded up the Missouri to its headwaters, crossed the Great Divide, and, landing on one of the tributaries of the Columbia, followed it and then the Columbia to the Pacific. After a dreary winter on the coast they returned to the United States by much the same route, and reached St. Louis in September, 1806. (See LEWIS AND CLARK EXPEDITION.) As a reward for this service Congress granted Captain Lewis a tract of 1500 acres of land from the public domain, and in 1807 the President appointed him Governor of Louisiana Territory, the northern part of the Louisiana Purchase, with headquarters at the village of St. Louis. Here he soon proved himself an able administrator. In this latter work he was ably assisted by Captain Clark, who had been appointed Indian agent. His leisure moments were occupied with preparing for publication the account of his great journey; but this he was destined never to finish, for in 1809 he was called to Washington on business, and while on the way met his death mysteriously in the cabin of a Tennessee pioneer. For biographical sketches, consult the works given under LEWIS AND CLARK EXPEDITION, and *The Original Journals of the Lewis and Clark Expedition* (New York, 1905).

LEWIS, MORGAN (1754–1844). An American soldier and jurist. He was born in New York City, the son of Francis Lewis (q.v.), graduated at Princeton in 1773, and, on the eve of the Revolution, began reading law in the office of John Jay. He joined the Continental army before Boston soon after the battle of Bunker Hill, and later in the same year was commissioned major in the Second Regiment of New York militia. In 1777 he was appointed quartermaster-general of Gates's army and distinguished himself at Saratoga, and in 1779 he served with Sullivan and Clinton in the campaign in central New York. After the war he took up the practice of law, married into the Livingston family, and became prominent in Anti-Federalist politics. After a term in the Assembly and a short period on the bench of Common Pleas in Dutchess County, where he made his home, he was elected in 1791 by the council of appointment to succeed Aaron Burr as Attorney-General of the State. A year later he was appointed a judge of the New York Supreme Court, and in 1801 was made Chief Justice. In 1804 the Livingston faction secured his nomination for the office of Governor and he was elected by a large majority over Burr. He was a strong supporter of Madison's war policy, and in 1812 was offered the portfolio of War. This he declined, but almost immediately accepted the post of quartermaster-general of the army, with rank of brigadier general. On March 2, 1813, he was commissioned major general and served on the Canadian frontier, taking part in the battles of Fort George, Sacketts Harbor, and French Creek. In 1815 he resigned his commission, and the rest of his life he spent on his estates in Delaware County. For many years he was president of the New York Society of the Cincinnati, and in 1831 was elected grand master of the Freemasons. Consult *Lives of the Governors of the State of New York* (Auburn, 1851), and Delafield, *Biography of Francis and Morgan Lewis* (New York, 1878).

LEWIS, TAYLER (1802–77). An American educator and author. He was born at Northumberland, Saratoga Co., N. Y.; graduated at Union College in 1820; studied law in Albany and practiced at Fort Miller, but relinquished his profession to devote himself to classical studies. He was appointed professor of Greek at the University of New York in 1838 and at Union in 1849. He was an able and conservative Christian apologete, a prominent exponent of classical study, and a political thinker of some ability, as may be seen from his *State Rights, a Photograph from the Ruins of Ancient Greece* (1864). He was a member of the Bible Revision Committee and wrote: *The Six Days of Creation* (1855); *The Bible and Science* (1856); *The Divine Human in the Scriptures* (1860); and, with E. W. Blyden and Timothy Dwight, *The People of Africa: Their Character, Condition, and Future Prospects* (1871).

LEWIS, WILSON SEELYE (1857–1921). An American Methodist Episcopal bishop, born at Russell, N. Y. He was superintendent of public schools at Belle Plaine, Ia., from 1882 to 1885; entered the ministry, joining the Upper Iowa conference of his church in 1885; and was principal of the Epworth Seminary from 1888 to 1897. In 1889 he received the degree of A.B. from Cornell College (Iowa) and in 1892 that of A.M. From 1897 to his election as Bishop in 1908 he was president of Morningside College, Sioux City, Ia. After his election he served as resident Bishop at Foochow, China, sharing with Bishop J. W. Bashford the oversight of all the missionary conferences of China.

LEWIS AND CLARK CENTENNIAL EXPOSITION. This exposition, which had for its object the celebration of the one hundredth anniversary of the exploration of the Oregon country (comprising the present states of Oregon, Washington, Idaho, and parts of Montana and Wyoming), was held in Portland, Oreg., from June 1 to Oct. 15, 1905. The site, consisting of 385 acres of land and lake, nestled at the base of the foothills of the Cascade Range, overlooking Guild's lake and the Willamette River, with a view embracing the snow-capped peaks of Mount Hood and Mount St. Helens, and was within easy reach of Portland by boat or street car. Ten large exhibit palaces formed the nucleus of the Exposition. Around these were clustered the State and Concessions buildings, special pavilions, the Administration group, the Auditorium, and other smaller exhibit buildings. The main exhibit palaces were, with the exception of the Forestry Building, in the Spanish Renaissance style of architecture and included the following: Agriculture; Liberal and Industrial Arts; Foreign Exhibits; Forestry; Horticulture; Mines and Metallurgy, United States Government Exhibit Building; Oceanic Building; United States Fisheries, Forestry, and Irrigation Building; Machinery, Electricity, and Transportation. The amusement features were grouped in a street on the west side of the grounds, which was called "The Trail." The Exposition was opened with appropriate ceremonies, and President Roosevelt touched the button in the White House that inaugurated the event. The cost of the Exposition was estimated at about $7,000,000, and at its close, after settling all bills, it was announced that a cash balance would be available to distribute among the subscribers to the stock. The grand total attendance was 2,545,509, of which 56,960 was on the last day and 56,000 on July 4.

LEWIS AND CLARK EXPEDITION. In American history, an expedition, under the command of Meriwether Lewis (q.v.) and William Clark (q.v.), which in 1804–06 penetrated from the Mississippi River, through territory now forming parts of Missouri, Kansas, Nebraska, South Dakota, North Dakota, Montana, Idaho, Washington, and Oregon, to the Pacific Ocean. The members of the party were the first white men to cross the continent between the Spanish possessions to the south and the British possessions to the north. The expedition was sent out by President Jefferson for the purpose of exploring the Louisiana Territory immediately after its purchase from France. As at first organized the party consisted of 29 members: Lewis and Clark, 14 regular United States soldiers, 9 Kentuckians who had volunteered, 2 French watermen, an interpreter and hunter, and a negro servant. At St. Louis 16 additional men were enlisted for the enterprise, to go, however, only part of the way. The party started from the vicinity of St. Louis, Mo., on May 14, 1804; passed up the Missouri River; reached the mouth of the Platte on July 26; arrived at the camps of the Mandans and Minnetarees, about 1600 miles distant from St. Louis, late in October; wintered there; broke up winter quarters April 7, 1805, 14 men having been sent back to St. Louis with collections and reports and two recruits having been gained; reached the mouth of the Yellowstone River April 26; and on May 26 sighted the Rocky Mountains. The three forks of the Missouri River were discovered on July 25 and named Jefferson, Madison, and Gallatin. The party proceeded up the Jefferson; crossed the Rocky Mountains in September; started down the Columbia River on October 16; and on November 7 came in sight of the Pacific Ocean. After wintering on the coast, they started on their return, March 23, 1806, and arrived at St. Louis Sept. 23, 1806, having traveled altogether a distance of almost 8500 miles. At times the explorers suffered terrible hardships, and from April, 1805, to August, 1806, were shut off from all communication with the world. Lewis and Clark collected a mass of valuable information concerning the physical characteristics, the fauna and flora, the climate, and the various Indian tribes of the territory traversed. The expedition was commemorated by Lewis and Clark Centennial Exposition at Portland, Oreg., in 1905 (q.v.).

Bibliography. For the best accounts, consult: Jefferson, *Message from the President of the United States, Communicating Discoveries Made in Exploring the Missouri, Red River, and Washita by Captains Lewis and Clark, Dr. Sibley, and Mr. Dunbar* (Washington, 1806; various subsequent editions); Gass, *A Journal of the Voyages and Travels of a Corps of Discovery under the Command of Captain Lewis and Captain Clark* (Pittsburgh, 1807; several subsequent editions); and especially Allen (Biddle ed.), *History of the Expedition under the Command of Captains Lewis and Clark* (2 vols., Philadelphia, 1814), which is based on the journals kept by Lewis and Clark themselves and has been frequently reprinted. The journals themselves have been edited by R. G. Thwaites (8 vols., New York, 1904–05). Consult also: N. Brooks, *First Across the Continent: Expedition of Lewis and Clark* (New York, 1901); a brief sketch by W. R. Leighton, *Lewis and Clark* (Boston, 1901); O. D. Wheeler, *The Trail of Lewis and Clark* (2 vols., New York, 1904).

LEWISBURG, lū′ĭs-bûrg. A borough and the county seat of Union Co., Pa., 30 miles by rail south by east of Williamsport, on the west branch of the Susquehanna River, and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, H 5). It is the seat of Bucknell University (Baptist), opened in 1846, and contains a public library. The borough is the commercial centre for a fertile grain and general farming region, and has woolen, flour, knitting, and lumber mills, furniture and chair factory, machine shop, acetylene-gas works, a shirt factory, a brick kiln, a milk condensery, etc. Pop., 1900, 3457; 1910, 3081.

LEWISOHN, lū′ĭ-zōn, ADOLPH (1849–). An American capitalist, born at Hamburg, Germany. Coming to the United States, he became president of the United Metals Selling Company and of the General Development Company, vice president of the Utah Consolidated Mining Company, and director of other corporations. By appointment of President Taft he was a member of the Commission on Industrial Relations in 1912. He made a number of large benefactions, including $300,000 to Columbia University for a School of Mines Building; $100,000 to Yale University; a German library and a stadium (1914) to the

College of the City of New York; and numerous gifts to Jewish charities.

LEWISOHN, Ludwig (1882–). An American writer and Germanic scholar. Born in Berlin, Germany, he was brought to the United States in 1890, and he graduated from the College of Charleston, S. C., in 1901, and from Columbia University (A.M.) in 1903. He worked on the editorial staff of Doubleday, Page & Co. in 1904–05 and wrote stories, poems, and criticism for various magazines in 1905–10. He was an instructor in German at the University of Wisconsin in 1910–11 and then became assistant professor of the German language and literature at Ohio State University. He was translator of Feuchtersleben's *Health and Suggestion* (1910) and Suderman's *Indian Lily* (1911); editor and chief translator of the *Dramatic Works of Gerhart Hauptmann* (vol. i, 1912; vol. v, 1915); and author of *The Broken Snare* (1908); *A Night in Alexandria* (1909); *German Style, An Introduction to the Study of German Prose* (1910); *The Modern Drama* (1914).

LEW'ISTON. A city and the county seat of Nez Perce Co., Idaho, located at the junction of the Snake and Clearwater rivers, 147 miles south by west of Spokane, Wash., on the Northern Pacific and the Oregon-Washington Railroad and Navigation lines (Map: Idaho, A 3). It has a Carnegie library, St. Joseph's Hospital, high school, United States Weather Bureau station, and Supreme Court library; and is the seat of a State normal school. Lewiston is the centre of a great mining, wheat and fruit growing district, and has flour and box-making mills. There are also dairying and stock-raising interests. The city was incorporated in 1890 and has adopted the commission form of government. The water works are owned by the municipality. Pop., 1900, 2425; 1910, 6043.

LEWISTON. A city in Androscoggin Co., Me., 35 miles by rail north of Portland, on the east bank of the Androscoggin River, opposite Auburn, on the Grand Trunk system, and on three branches of the Maine Central Railroad (Map: Maine, B 4). Several bridges here span the river. The stream at this point falls 50 feet, affording fine water power, which is utilized by means of a distributing dam and canal, the system having been built at a cost of $1,000,000 and having a developed power of 30,000 horse. It is the most important industrial city in Maine, the manufactures including cotton and woolen goods, cotton and woolen mill machinery, foundry products, boots and shoes, belting, lumber products, carriages, shirts, iron beds, bobbins, shovel handles, and bricks. There are also extensive bleaching and dye works. Lewiston is the seat of Bates College (q.v.), and has a fine city hall, a public park, the General and St. Mary's hospitals; a fine soldiers' monument, erected in the city park in 1865; homes for aged women and children; the Healy Orphan Asylum; Elks and Moose homes; the Manufacturers and Mechanics' Library, affiliated with the Carnegie library, and the collegiate library. There are municipally owned water works and electric-light plant. Pop., 1900, 23,761; 1910, 26,247; 1914 (U. S. est.), 27,305; 1920, 31,791. Settled in 1770 and called the "Plantation of Lewiston" until 1795, when it was incorporated as a town, Lewiston was chartered as a city in 1861.

LEWISTON. A village and summer resort in Niagara Co., N. Y., on the Niagara River, 7 miles north of Niagara Falls; the terminus of a line of steamers to Toronto; on the New York Central and Hudson River Railroad (Map: New York, A 4). It has a public library. The Gorge Road, the Lewiston and Queenstown Bridge, and the Tuscarora Indian Reservation are of interest in this locality. Pop., 1910, 713. A blockhouse was erected here by the French in 1720, but was soon abandoned, though an Indian village, later the home of Joseph Brant, grew up in the vicinity. Near it are Devil's Hole and Bloody Run—the scene of a terrible Indian massacre on Sept. 14, 1763. In 1813 (December 19) Lewiston was burned by the English and Indians. Consult Pool, *Landmarks of Niagara County, N. Y.* (Syracuse, 1897).

LEW'ISTOWN. A city and the county seat of Fulton Co., Ill., 45 miles southwest of Peoria, on the Chicago, Burlington, and Quincy Railroad (Map: Illinois, D 5). The city has a Carnegie library. It carries on considerable trade in live stock and agricultural and dairy products; and manufactures bee traps, cigars, concrete blocks, etc. The water works are owned by the city. Pop., 1900, 2504; 1910, 2312.

LEWISTOWN. A city and the county seat of Fergus Co., Mont., 118 miles by rail east-southeast of Great Falls, on the Great Northern and the Chicago, Milwaukee, and St. Paul railroads, and on Spring Creek, which affords excellent water power (Map: Montana, G 2). The city contains a fine high school, the Catholic Hospital, and a Carnegie library. Its chief industries are gold and coal mining, wheat growing, and the manufacture of bricks, flour, and creamery products. The city is progressing rapidly as the distributing centre for a wide area. Lewistown owns its water works. Pop., 1900, 1096; 1910, 2992.

LEWISTOWN. A borough and the county seat of Mifflin Co., Pa., 61 miles by rail northwest of Harrisburg, on the Juniata River and on the Pennsylvania Railroad (Map: Pennsylvania, F 6). It is in a fertile farming district which has mineral deposits, particularly of iron and glass sand; and there are foundries, furnaces, steel works, flour and lumber mills, a silk mill, and manufactories of edge tools, hosiery, etc. The borough contains a hospital and a public library. Pop., 1900, 4451; 1910, 8166; 1914 (U. S. est.), 9748.

LEWIS-WITH-HARRIS. A Scottish island, the northernmost of the outer Hebrides (q.v.), 30 miles northwest of Ross-shire, from which it is separated by the Minch (Map: Scotland, B 1). Area, 770 square miles. Pop., 1901, 32,160; 1911, 32,886. The coasts are wild and rugged: the chief indentations are Broad Bay and Lochs Erisort, Seaforth, Resort, and Roag. The surface is for a considerable portion swampy and covered with peat. Barley and potatoes are the principal crops raised. The inhabitants are of Celtic extraction, with the exception of a colony in the north, who, although they speak the Gaelic language, are of Scandinavian descent. The chief industries of the island are cattle raising and sheep farming, while Harris is famous for its homespun tweeds. Relics of antiquity and remains of ancient forests abound. At Callernish exists the most perfect Druidical stone circle found anywhere in the British Isles. Carloway, on the west coast, has important sea fisheries, while the island is famous for its salmon, trout, and abundance of feathered game. Stornoway (q.v.), on the east coast, is the capital town.

LEX (Lat., law). The ancient Latin term for a statute. In its widest sense it covered any enactment of any body constitutionally empowered to legislate; used more strictly the term denoted rather the enactments of the *comitia centuriata*. See Comitia; Legislation. For a full list of the more important *leges*, consult the article "Lex" in William Smith, *A Dictionary of Greek and Roman Antiquities*, vol. ii (3d ed., London, 1891).

LEX AGRARIA. See Agrarian Laws.

LEX CURIATA. See Comitia; Emperor; Imperium.

LEX FO′RI (Lat., the law of the forum). The law administered in the jurisdiction in which cause is pending for determination. Ordinarily, of course, a court applies its own law, i.e., the law of the state or country in which it exercises its jurisdiction, but in certain cases it applies foreign law, as the law of the state or country in which a contract was made (*lex loci contractus*), or in which property involved in the suit is situated (*lex loci rei sitæ*). See Conflict of Laws; Forum.

LEX HORTENSIA. See the first Hortensius, Quintus.

LEXICOG′RAPHY. See Dictionary.

LEX′ICON. See Dictionary.

LEX′INGTON. A city and the county seat of Fayette Co., Ky., 82 miles south of Cincinnati, Ohio, on the Cincinnati, New Orleans, and Texas Pacific, the Chesapeake and Ohio, the Louisville and Nashville, and the Southern railroads (Map: Kentucky, F 3). It is the centre of the widely celebrated blue-grass region, is well laid out, and has a Carnegie library, a State asylum for the insane, Kentucky Reform School, Kentucky State University, Sayre Female Institute, Hamilton Female College, Transylvania University, St. Catherine's Academy (Roman Catholic), Knights of Pythias and Odd Fellows widows' and orphans' homes, Good Samaritan and St. Joseph hospitals, and High Oaks Sanitarium. Other places of interest are Woodland Park, the race tracks, United States Weather Bureau station, and several noted stock farms. Lexington is commercially important as the market for the blue-grass district and is well known also for the manufacture of Bourbon whisky, which, in addition to horses and tobacco, it exports in large quantities. Other manufactures are flour, saddlery and harness, carriages and wagons, canned goods, hemp, parquetry flooring, and brewery, planing-mill, foundry, and machineshop products. Lexington adopted the commission form of government in 1912. Pop., 1900, 26,369; 1910, 35,099; 1914, 38,819; 1920, 41,534.

In 1775 several hunters, including Robert Patterson, Simon Kenton, and William McConnell, stopped on the site of Lexington, gave it its present name to commemorate the battle of Lexington, and built a cabin to confirm their title to the land. A permanent settlement was made by Patterson four years later. In 1782 the town was incorporated by the Virginia Legislature. From 1792 to 1793 it was the capital of Kentucky and here, in 1792, assembled the first State Legislature. In 1832 a city charter was obtained. It was the home from 1797 until his death of Henry Clay, in memory of whom a fine monument has been erected. There are also monuments to John C. Breckinridge and John H. Morgan.

LEXINGTON. A town in Middlesex Co., Mass., 12 miles northwest of Boston, on the Boston and Maine Railroad (Map: Massachusetts, E 3). Among the points of interest are Memorial Hall, with fine marble statues of John Hancock and Samuel Adams; Cary Memorial Library, containing 25,000 volumes; a statue of Captain Parker; the battle ground; the Soldiers' Monument, erected in 1799; the Hancock-Clarke house (built in part in 1698), where Hancock and Samuel Adams slept the night before the battle of 1775, and now the repository of an interesting collection of relics; Monroe Tavern (built in 1695), Earl Percy's headquarters; Buckman Tavern (built about 1690), the rendezvous of the minutemen; the old Belfry clubhouse; the town hall; the high school; the Hancock schoolhouse; and the old burying ground. The leading industries are farming and dairying and the manufacture of pipe fittings and leather binding. Pop., 1910, 4918. Settled in or about 1642, Lexington was a part of Cambridge and was known as "Cambridge Farms" until 1691, when it was made into a separate precinct and given its present name probably from Lord Lexington. It was incorporated as a town in 1713. It was the birthplace of Theodore Parker.

Lexington is celebrated in American history for having been the scene of the first contest in the Revolutionary War, fought April 19, 1775. On the night of April 18 the Americans discovered the intention of General Gage to send a detachment of British troops to Concord for the purpose of destroying some military stores which had been collected there, and also to seize the persons of John Hancock and Samuel Adams, who were living temporarily in Lexington. Information of this design was spread abroad by Paul Revere, who rode from Charlestown to Lexington warning farmers along the route. On the same evening General Gage, who commanded the royal troops in Boston, had picketed the roads in the vicinity and dispatched Lieutenant Colonel Smith with 800 men on the expedition to Concord. When the advance of the British column reached Lexington in the early morning it was opposed by about 70 militiamen, who had formed on the town common, under command of Capt. John Parker. The British were commanded by Major Pitcairn, who, on observing the preparations made to resist his progress, halted his men to load, and then advanced at double-quick, he himself riding in front and ordering the Americans to lay down their arms and retire. As the militia held their ground, Major Pitcairn fired his pistol at them, and having given the order to his men, the latter discharged their muskets, with the result of killing four and wounding nine of the militiamen. The latter retreated, four being killed while fleeing. A scattering fire from Captain Parker's men wounded three British soldiers, and the militia being dispersed, the British force proceeded to Concord to effect the main object of the expedition. The distance is only about 6 miles, and the place, which became the second battleground of that day, was reached at about 7.30 o'clock. The country was by this time thoroughly aroused, and as many as 180 militiamen had assembled, who, as the British came into view, fell back and took position on the side of a hill, afterward crossing the North Bridge over the Concord River by order of Colonel Barrett, who had assumed command. The British, being left in possession of the town, proceeded to the destruction of such arms and provisions as they could find, a detachment being sent to gain control of the North and South bridges. This body was attacked by the militia at the North Bridge, and a brisk fight followed, which resulted in slight losses on both sides. The British, having effected all the damage possible, began to retreat, being followed by the Americans, who kept up a galling fire from behind rocks, trees, and other defenses. The timely arrival of a large force under Lord Percy prevented a disaster. The news of these encounters thrilled the country and impressed the Americans with a sense of their own capability to contend with the tried regulars of the British army. The British losses for the entire day were 73 killed, 174 wounded, and 26 missing; the American losses were 49 killed, 39 wounded, and 5 missing. Consult: Charles Hudson, *History of the Town of Lexington* (Boston, 1868), revised and continued to 1912 by the Lexington Historical Society; W. D. Howells, *Three Villages* (Boston, 1884); Richard Frothingham, *History of the Siege of Boston and of the Battles of Lexington, Concord, and Bunker Hill* (Boston, 1873); *Proceedings of the Lexington Historical Society and Papers Relating to the Town* (Lexington, 1890–).

LEXINGTON. A city and the county seat of Lafayette Co., Mo., 43 miles by rail east of Kansas City, on the south bank of the Missouri River and on the Missouri Pacific Railroad (Map: Missouri, C 2). It has the Wentworth Military Academy, Central College for Women, and Lexington Female College. The city is the centre of a corn-growing region, and coal is mined in the vicinity and shipped extensively. The government is administered under statutory provisions, by a mayor, elected biennially, and a unicameral council. Lexington was settled in 1821 and incorporated about nine years later. Pop., 1900, 4190; 1910, 5242. There is a hill to the northeast of the city, where in September, 1861, 3000 Union soldiers, under Col. James Mulligan, sustained a siege against 12,000 Confederates under Gen. Sterling Price, at last surrendering the town and garrison on the 21st. A few days later Price withdrew, leaving only a small garrison, and on October 16 a Union force of about 230 under Major J. White released the Union prisoners here and captured about 70 of the Confederates.

LEXINGTON. A city and the county seat of Davidson Co., N. C., 88 miles (direct) west of Raleigh, on the Southern and the Winston-Salem Southbound railroads (Map: North Carolina, B 2). The chief industrial establishments are woodworking plants and cotton mills. Situated in a rich agricultural region, Lexington produces cotton, tobacco, wheat, oats, and corn. The water works and electric-light plant are owned by the city. Pop., 1900, 1234; 1910, 4163.

LEXINGTON. A town and the county seat of Rockbridge Co., Va., about 50 miles by rail northwest of Lynchburg, on the north fork of the James River and on the Chesapeake and Ohio and the Baltimore and Ohio railroads (Map: Virginia, E 4). It has picturesque surroundings and is the centre of a fertile agricultural, fruit-growing, and stock-raising region. There are some manufactures. The town is the seat of Washington and Lee University (q.v.), and of the Virginia Military Institute, founded in 1839. Other features of special interest are the statues of Generals Lee and Jackson, whose graves are also here, Lee Memorial Church, and Jackson Memorial Hospital. The famous Natural Bridge (q.v.) is 14 miles south, and in the opposite direction are several mineral springs which have become popular resorts. Lexington owns and operates its water works. Pop., 1900, 3203; 1910, 2931.

LEX'IS, Wilhelm (1837–1914). A German economist, born at Eschweiler, near Aix-la-Chapelle. He studied mathematics and natural science at the University of Bonn and in 1861 went to Paris, where the economics of France chiefly claimed his attention. He was appointed professor of political economy at the University of Strassburg in 1872 and accepted a call to the chair in the same branch at Dorpat in 1874, at Freiburg in 1876, at Breslau in 1884, and at Göttingen in 1887. A partial list of his writings includes: *Einleitung in die Theorie der Bevölkerungsstatistik* (1875); *Zur Theorie der Massenerscheinungen in der menschlichen Gesellschaft* (1877); *Die Wirkung der Getreidezölle* (1889); *Der gegenwärtige Stand der Währungsfrage* (1896); *Die neuen französischen Universitäten* (1901); *Reform des höheren Schulwesens in Preussen* (1902); *Abhandlung zur Theorie der Bevölkungs- und Moralstatistik* (1903); *Unterrichtswesen im Deutschen Reich* (4 vols., 1904); *Das Handelswesen* (2d ed., 1912); *Allgemeine Volkswirtschaftslehre* (2d ed., 1913). With Conrad, Elster, and Löning, he edited the *Jahrbuch für National-Oekonomie* (after 1891) and the *Handwörterbuch der Staatswissenschaften* (7 vols., 2d ed., 1898–1901).

LEX JU'LIA MUNICIPA'LIS. See Heraclea, 1.

LEX LOCI. See Lex Fori; Conflict of Laws.

LEX MUNICIPA'LIS. See Municipal Law.

LEXOW, lĕks'ou, Clarence (1852–1910). An American legislator and municipal investigator, born in Brooklyn, N. Y. He graduated from Columbia Law School in 1874 and studied later at the University of Jena. As a lawyer, he settled in New York City, and helped establish the firm of Lexow, Mackellar, and Wells, which received the patronage especially of German-Americans. While residing in Nyack, he became active in politics as a Republican and was an unsuccessful nominee for Congress in 1890. When elected a member of the New York State Senate in 1893 he immediately became a leader. His resolution calling for an investigation of the New York City police led to the creation of the famous Lexow Committee of which he was chairman. The committee's report revealed a system of protection given to vice and resulted in many important reforms. As chairman of committees investigating trusts and on primary election reform Lexow presented findings that were embodied in several important statutes, and he was the author of the bill creating the city of Greater New York. He introduced the gold plank in the platform of the Republican State Convention of 1896 and was a presidential elector in 1900. Consult the official reports of his committees on the New York police (5 vols., 1895) and on the trusts (1897).

LEYBACH, lī'bäg, Ignace Xavier Joseph (1817–91). A French composer, born at Gambsheim (Alsace). He began his musical studies in Strassburg and later went to Paris, where he was a pupil of Kalkbrenner, Pixis, and Chopin. In 1844 he was appointed organist of the cathedral in Toulouse. He wrote more than 200 compositions for the pianoforte, which enjoyed an enormous popularity because of their ingratiating melody and facility of execution. His great organ school in three volumes, *L'Organiste pratique*, is a work of considerable merit.

LEYDEN, or **LEIDEN**, lī′dĕn. One of the oldest and most famous cities of the Netherlands, situated in the Province of South Holland, on the Old Rhine, 22 miles southwest of Amsterdam and 6 miles inland (Map: Netherlands, C 2). On the east the river enters in two branches, which unite in the centre of the town, which is also traversed by several small canals. Of its churches the most noteworthy are St. Pancras (Hooglandsche Kerk), a fine late Gothic building originally erected in the fifteenth century and restored in 1885–1902, and the church of St. Peter, dating from 1315. Both churches contain monuments to distinguished scholars. The sixteenth-century town hall in Dutch style, and the Lakenhal (cloth hall), dating from 1640 and housing the Municipal Museum (founded in 1869), are among the prominent secular buildings. On an elevation in the centre of the town are the ruins of the old Burg. Besides its university (see Leyden, University of), to which it chiefly owes its fame, Leyden has a Gymnasium, two other high schools, and a navigation school. Leyden was the birthplace of Rembrandt, Gabriel Metsu, Gerard Dou, Jan Steen, and other celebrated painters. In the fifteenth century its textiles were famous throughout Europe. The chief manufactures are various woolen products, cotton goods, leather, iron products, and spirits. There is a considerable trade in local manufactures and dairy products. The population of Leyden is believed to have been about 100,000 in the seventeenth century. In 1900 the population of the commune was 54,421; in 1909 (census of December 31), 58,253; in 1912 (est. of December 31), 59,207. The area of the commune is 565 hectares.

The most brilliant event in the history of Leyden was its heroic defense against the Spaniards, who besieged the city for a whole year —1573–74. The citizens withstood the siege almost to the last point of endurance, when William of Orange at last relieved them by opening the dikes and flooding the country. From 1609 to 1620 Leyden was the place of refuge of a band of English Nonconformists from whom came the Pilgrims who founded Plymouth Colony. In 1807 a large section of the most beautiful quarter of the city was laid in ruins by the explosion of a powder ship in the river. This part is now occupied by a park.

LEYDEN, Ernst von (1832–1910). A German physician, born at Danzig and educated in Berlin at the Friedrich Wilhelm Institute. From 1854 to 1865 he served as military surgeon, then became professor at Königsberg, in 1872 went to Strassburg, and in 1876 succeeded Traube in Berlin. He retired in 1907. His publications include: *Zur Pathologie des Tetanus* (1863); *Ueber Reflexlähmungen* (1870); his great work *Klinik der Rückenmarkskrankheiten* (1874–76); *Tuberkulosis* (1902); and many contributions to the *Zeitschrift für klinische Medizin*, which he founded in 1879 with Frerichs. His *Lebenserrinerungen*, compiled by his sister, appeared in 1910.

LEYDEN, John (1775–1811). A Scottish poet and Orientalist. He was born of poor parents at Denholm in Roxburghshire, Scotland, Sept. 8, 1775. After a course of study in Edinburgh University, during which he learned several European and Oriental languages, he was licensed as a preacher of the Church of Scotland. His first work (1799) was *A Historical Account of the Discoveries and Settlements of Europeans in Northern and Western Africa*, suggested by the travels of Mungo Park. He contributed poems and translations to the *Edinburgh Magazine*, wrote for Lewis's *Tales of Wonder*, helped Scott to get materials for his *Minstrelsy of the Scottish Border*, and edited the *Scots Magazine* for a year. In 1801 he edited the *Complaynt of Scotland*, a sixteenth-century work, which aroused some interest at the time. He then studied medicine, and sailed for India in 1802. Ill health forced him to leave his station at Madras and go to Penang, where he studied the Indo-Chinese tribes. He was successively professor and judge at Calcutta. When the expedition to Java was undertaken, Leyden accompanied it. A second edition of his *Scenes of Infancy: A description of Teviotdale*, a poem, was issued at Edinburgh within the year of his death. He died at Batavia, Aug. 28, 1811. His chief work is the "Essay on the Languages and Literatures of the Indo-Chinese Nations," in the *Asiatic Researches*. His collected poems were published in 1819; a new edition, *Poems and Ballads*, in 1858, with memoir by Scott; and two centenary editions in 1875.

LEYDEN, John of. See John of Leyden.

LEYDEN, Lucas van. See Lucas van Leyden.

LEYDEN, University of. A Dutch university, founded in 1575 by the provinces of Holland and Zealand, under the patronage of William the Silent, Prince of Orange, as one of the rewards to the citizens of Leyden for the heroic defense of the place against the Spaniards. From the beginning it was a centre of Protestant learning, and drew to itself many English Puritans and French Huguenots. In 1807 it was raised to the rank of a royal university, but with the annexation of Holland to France it sank to the grade of an academy, forming part of the University of France. After the reorganization of the universities by William I, in 1815, it lost ground, but was again reorganized in 1878 on an equality with the royal universities. It numbered in 1912–13 some 1211 students, chiefly in law and medicine. Its library, founded in 1575, contains some 400,000 volumes, 3000 maps, 3400 Oriental and 3000 other manuscripts.

LEYDEN JAR. See Electricity; Condenser.

LEYDIG, lī′dĭk, Franz von (1821–1908). A German zoölogist, born at Rothenburg-an-der Tauber. He studied medicine at Würzburg and Munich, became professor at Würzburg in 1855, at Tübingen in 1857 and in 1875 at Bonn, and retired in 1895. His more important works include: *Anatomisch-histologische Untersuchungen über Fische und Reptilien* (1853); *Der Eierstock und die Samentasche der Insekten* (1866); *Die augenähnlichen Organe der Fische* (1881), on a supposed sixth sense; *Zelle und Gewebe* (1885); *Horæ zoölogicæ: Zur vaterlandischen Naturkunde* (1902).

LEYE. See Lys.

LEYLAND, John. See Leland, John.

LEYS, līs *or* lā, Hendrik, Baron (1815–69). A Belgian historical and genre painter. He was born at Antwerp, Feb. 18, 1815, and studied with Ferdinand de Braekeleer, his brother-in-law, and later with Wappers, at the Antwerp Academy. He received the great gold medal at the Brussels Academy in 1835; the next four years he studied in Paris. There he was strongly influenced by the French Romanticists, although some of his work of the same period shows also the influence of Rembrandt and Van Dyck. In 1839 he visited Holland, where he took up the manner of the Dutch genre painters. His "Dutch Church Service," "Dutch Society of the Seventeenth Century," both in the National Gallery, Berlin, and "Wedding of the Seventeenth Century" (1845) contain such rich details, both in costume, decoration, and treatment of draperies, as are found in a Pieter de Hoogh or a Metsu. The years 1852, 1859, 1863, he spent in Germany; and during the time he was strongly influenced by Dürer and Cranach. To this period belong "Erasmus in his Study" (1853), "Luther as Chorister in Eisenach," "Luther's Home in Wittenberg" (1858). He was the recipient of great gold medals at Paris in 1855 and 1867 and many other honors, and his death, August 26, 1869, was marked by universal mourning in Antwerp. A statue was erected to his memory on the Boulevard Leys.

To Leys is largely due the revival of a national art in Belgium by the return to the ideals of the old Flemish and Dutch masters. He was a fine colorist and a good draftsman, in his first style showing delight in careful detail, while in his second style his work is as severe in outline as the paintings of the fifteenth and sixteenth centuries, with the simplicity of the early Flemish and German masters, even to their faults in drawing. Among his most important works are the following: "The Institution of the Golden Fleece" (King of the Belgians); "The Flemish Wedding" (1859) and "Mass is Over" (1866), in the Antwerp Gallery; "Mass in Honor of Bertall de Haze" (1854) and the "Spanish Fury," Museum of Brussels; "Lucas Cranach Painting Luther" (1863) and "The Education of Charles V" (1861), in the Vanderbilt collection, Metropolitan Museum, New York; "Edict of Charles V" and "Dutch Interior," Walters Gallery, Baltimore; "Rembrandt's Studio" (1837); "Restoration of Divine Service in Antwerp Cathedral" (1845); "Studio of Frans Hals" (1868); "Dürer Painting Erasmus" (1857), Berlin Museum; four scenes from the history of Antwerp and portraits of 12 princes celebrated in connection with the city (1864–69), City Hall, Antwerp. Consult Sulzberger, *Henri Leys* (Brussels, 1835), and A. L. C. Lemonnier, *Ecole belge de peinture* (ib., 1906).

LEYTE, lā′tȧ. An island of the Visaya group in the Philippines, constituting with a number of small dependent islands the Province of Leyte (Map: Philippine Islands, E 5). It is situated to the southeast of Luzon and is separated from the island of Samar on the northeast by the Strait of San Juanico, from 1 to 3 miles wide, and from Mindanao on the southeast by the Strait of Surigao (q.v.). The principal dependent islands are Biliran, 16 miles long by 13 broad (area, 144 square miles), off the north coast; Panaón, 19 miles long by 6 broad (area, 76 square miles), off the southeast coast; and the Camotes, a group of three islands 20 miles from the west coast. The island of Leyte has an extreme length from northwest to southeast of 121 miles and an extreme width of 52 miles. Its area is 3872 square miles; with the dependent islands, 4214 square miles. It has a roughly rectangular shape, with a large bay indenting each of the four sides, and a number of smaller inlets forming in several places excellent harbors, such as that of Tacloban (q.v.). The coasts are, as a rule, clear, with deep water close inshore, except along the northwestern end, where there are reefs and shoals. The east coast is high and steep; the west low and sandy, interrupted by a number of rocky headlands. The interior is generally mountainous; an irregular chain with a number of peaks runs parallel with the west coast, about 6 miles inland, and reaches in Mount Sacripante a height of 3930 feet. There are several extinct volcanoes, some of which are over 4000 feet high. The rivers of Leyte are numerous, but are, as a rule, small mountain torrents. The chief among them are the Bao and the Leyte, both in the northwest. There is only one considerable lake, the Laguna de Bito, 5 miles long by 3 broad, situated near the centre of the island.

The climate is temperate and healthful; the extreme annual temperatures are 52° F. lowest and 86° F. highest. The island is abundantly watered and very fertile. Large parts of it are covered with forests, in which one of the predominant species is the Dammar pine, from which great quantities of pitch are produced; these forests also yield some of the finest hard woods of the archipelago. The numerous broad valleys are among the best-cultivated lands of the Philippines and yield abundant crops of hemp of an excellent quality, besides sugar, rice, coffee, cotton, and corn. The island produced, in 1902, 10,116,044 kilograms of manila hemp, or more than any island in the Philippine group except Luzon. Leyte also ranked second in production of bananas and third in the production of copra. The mineral wealth of Leyte includes gold, silver, iron, lead, and sulphur, only the last mentioned being mined to any extent. The leading industries consist in the manufacture of hempen fabrics and coconut oil. Shipbuilding is also an important industry, the shipyards of Tacloban employing several hundred persons. The population numbered, in 1903, 357,641, almost all of whom are Visayans, speaking the Visayan language. They are intelligent and industrious and show great interest in American institutions. The census of 1903 classes the entire population as civilized. Of the 250,000 above 10 years of age 51,000 were classed as literate and 55,100 able to read but not write. The school attendance in 1903 was reported as 45,393.

Leyte was first seen by Magellan in 1521. Its original name was Abuyog, and the Spaniards called it first Filipina, which name was later extended to the whole archipelago. Civil government under American rule was instituted on April 22, 1901, and the inhabitants showed such a friendly attitude towards the new régime that before the end of the year most of the island was intrusted to the native constabulary.

LEYTON, lā′ton, or Low Leyton. A town in Essex, England, a London suburb, 5½ miles northeast of St. Paul's (Map: London, D 8). It owns an electric-light plant, an economical and efficient sewerage system, free libraries, a fine technical institute, opened in 1896, and an isolation hospital. Leyton is mainly a residential suburb and has little or no manufacturing industries. Roman remains have been found here. Pop., 1901, 98,900; 1911, 124,735.

LHASA, lä′sȧ, **LASSA**, or **H'LASA** (Tibetan

Lhā-Sā, God's place or house; in Chinese, *Fŏ-fi*, Buddha land). The capital of Tibet, and the chief seat of the Lamaistic hierarchy, situated on the right or north bank of the Kyi-ch'u, a left-bank tributary of the Tsangpo or Brahmaputra River, in an elevated plain (12,500 feet above sea level), sometimes called Wo-ma-t'ang (milk plain), sloping to the north for about 12 miles and surrounded by lofty, barren mountains 3000–6000 feet higher (Map: China, F 5). The city is small, about 2 miles long and 1 mile wide, but regularly laid out; the principal streets are wide, well lined with Tibetan, Chinese, and Nepalese shops. There is no wall around the city; a broad highway encircles it instead. The whole town when seen by the British in 1904 was exceedingly filthy. The principal buildings are of stone, two or three stories high, but there are many of adobe and sun-dried brick. Outside they are clean and whitewashed, inside very dark and filthy. The first floor always has a yak stable. The houses have flat roofs and no chimneys. The chief trade is in precious stones, gold, velvet, cashmere, and other fabrics peculiar to the region; and in tea from China, silk, lace, carpets, Russian goods, musk, etc. There is little traffic on the streets. Carts are unknown. People always travel on foot. Only the Dalai Lama and the two Ambans ride in sedan chairs, a privilege reserved to them exclusively. The chief interests of the city, however, are religious; thousands of pilgrims visit it annually from Mongolia, Kashmir, Nepal, etc., and Buddhist temples and monasteries abound. Near its centre stands the cathedral, a lofty, flat-roofed shrine, resplendent with green and gold, known as the Jo-K'ang or Lha-K'ang (the house of the Lord), surrounded with conventual houses and gardens. Here stands a life-size image of Buddha as a prince, about 16 years of age, said to have been cast during his lifetime in Magadha, the Buddhist Holy Land.

In the suburbs to the west of the city is the fortified palace of the Dalai Lama, the head of the Lamaist church, and the incarnation of Avalokiteshvara (see KWAN-YIN), an imposing pile of lofty buildings, entirely of stone, with 490 rooms and 1333 windows. The palace is painted in white, brown, and crimson. Inside it is dirty, the only clean part being the rooms of the Dalai Lama. It is perched on the rocky hill, called by its founder Mount Potala, which rises from the plain to a height of 375 feet. A replica of the palace was erected in Jehol (q.v.), in east Mongolia, by the Emperor K'ien-lung. These buildings date from 1643 and are well described by Huc and Gabet, Waddell, Landon, and others. To the south of this, also on a rocky hill, is the pavilion used by the Tashi Lama, of the Tashilhumpo Monastery at Shigatse, when he visits the city. Since the flight of the Dalai Lama to Mongolia in 1904, he has been recognized as the successor of that head of the Buddhist faith. Other great monastic establishments in the neighborhood are Dupon, 3 miles west, with 7500 monks and students; the Gandan, east of the city, with 2000 Lamas; and 1½ miles north, Sera, sheltering 5500 monks, taking its name from three large temples gilt all over within, *ser* being the Tibetan word for gold. The population scarcely exceeds 10,000 persons in civil life, of whom two-thirds are women, about 16,000 monks, and a small Chinese garrison. The affairs of the city, as of Tibet, are in the hands of the Dalai Lama, as the politico-religious chief, and two Chinese "Ambans" appointed every four years. Below these are native officials.

Among the few who succeeded in entering the forbidden city were Manning, in 1811; Huc and Gabet, in 1846; Nain Singh, an Indian surveyor, in 1874; Sarat Chandra Dass, in 1882; Narzunof and Zibikof, Russian subjects, and Kavagushi, the Japanese Buddhist, shortly before the British Mission of 1904 forced its way into the city. In 1906–07 a Chinese Mission visited Tibet, and Lhasa in particular.

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LHERMITTE, lĕr'mēt', LÉON AUGUSTIN (1844–). An eminent French painter and etcher. He was born July 31, 1844, at Mont Saint-Père (Aisne) and studied at Paris under Lecoq de Boisbaudran. He was of peasant parentage, and his great reputation rests upon his scenes of peasant life, rendered with great accuracy and power, in a large sculptural style and with little sentimental appeal. Particularly effective are the religious subjects in which he represents Christ surrounded by peasants in contemporary costume. He ranks as one of the most eminent painters of his day in France. His masterly draftsmanship and composition are particularly noticeable in his charcoal drawings, such as "Saying Grace." Fine examples of his paintings are "The Grandmother" (1881, Ghent Museum); "The Vintage" (1884, Metropolitan Museum, New York); "Harvester's Wages" (1882, Luxembourg); "The Friend of the Lowly" (1894, Boston Art Museum); "Death and the Woodcutter," one of the notable French pictures at St. Louis in 1904; "Among the Lowly" (1905, Metropolitan Museum, New York); "The Family" (1908, Corcoran Gallery, Washington); "Emigrants" (1909); "The Fishermen" (1909). He also painted mural decorations in the Sorbonne and the Hôtel de Ville, Paris, and landscapes of great power. As an etcher, he possesses great charm, purity, and spontaneity. He first essayed this medium in 1871 during a visit to England, where he collaborated in E. Lièvre's *Works of Art in the Collections of England* (1873) and in the *Portfolio*, an etching periodical. He also contributed plates to the *Gazette des Beaux Arts* and other French periodicals. Lhermitte was awarded a grand prize at the Paris Exposition of 1889 and in 1905 was elected a member of the Académie des Beaux-Arts and chosen professor in the Ecole des Beaux-Arts. Consult Henriet, *Les eaux-fortes de Léon Lhermitte* (Paris, 1905), and *International Studio*, vol. xxxviii (New York, 1909).

LHERZOLITE, lĕr'zō-līt (named from Lherz in the Pyrenees). An igneous rock of the peridotite (q.v.) family, of which the essential minerals are olivine, diallage, and an orthorhombic pyroxene.

LHÉVINNE, lā-vēn', JOSEF (1874–).

A celebrated Russian pianist. At eight he was playing in public, and at 15, after studying under Vassily Safonov (q.v.) at the Imperial Conservatory of Moscow, he won considerable distinction by a public performance, led by Rubinstein, of Beethoven's Fifth Concerto for piano and orchestra. In 1891 he received a gold medal from the Imperial Conservatory and four years later the Rubinstein prize at Berlin. He taught piano at the Imperial Conservatory in 1902–06. Thereafter he spent his time touring the world as a piano virtuoso. He visited the United States for the first time in 1906 and made several subsequent tours, always meeting with unqualified success.

L'HÔPITAL, lō'pē'tȧl', GUILLAUME-FRANÇOIS-ANTOINE DE, MARQUIS DE SAINTE-MESME and COMTE D'ENTREMONT (1661–1704). A French mathematician, born in Paris, the son of Gen. Anne-Alexandre de L'Hôpital. He early displayed remarkable mathematical ability, solving at the age of 15 certain problems on the cycloid proposed by Pascal. For a short time he studied with Johann Bernoulli, when the latter was in Paris. He entered the army and served for some time as captain of cavalry, but his extreme myopia compelled him to relinquish his chosen profession. The rest of his life was devoted to mathematics. He was one of the first to put into intelligible language the Leibnitzian theory of the calculus. In 1693 he was made honorary member of the Academy of Sciences of Paris and soon thereafter added to his reputation by a number of important discoveries in the new analysis. He found the curve whose tangents, terminated by the axis, are proportional to the segments of the axis intercepted between the curve and the tangent, and solved the problem of the brachistochrone. His first great work, and the first treatise to popularize the new calculus, was the *Analyse des infiniment petits pour l'intelligence des lignes courbes* (1696, and numerous subsequent editions). He died of apoplexy before the publication of his second work, *Traité analytique des sections coniques* (1707; Eng. ed., 1723). His numerous memoirs on mathematical subjects are to be found in the *Recueil de l'Académie des Sciences* (1699–1701) and in the *Acta Eruditorum* (1693–99).

L'HÔPITAL, MICHEL DE (1507–73). A French statesman, born near Aigueperse in Auvergne. He was the son of the Constable de Bourbon's physician. Implicated in the disgrace of the Constable, young L'Hôpital was imprisoned for a time in 1523, but eventually escaped to Italy, where at Padua and Bologna he completed after six years the law studies begun at Toulouse and accepted a civil office at the papal court in Rome. On returning to France, in 1534, he soon became a counselor in the Parliament of Paris (1537) and was employed on various diplomatic missions, and through successive offices he gradually rose to be Chancellor of France in 1560. It was with the aid of Catharine de' Medici, and in opposition to the Guises, that he was thus elevated, and the policy he inaugurated was one of tolerance and conciliation towards the Huguenots. The Prince of Condé was pardoned; meetings of the Notables and of the States-General were held; and the important Ordinance of Orléans (1561) marked a step forward in the development of the state in that it abolished the Concordat of Francis I, did away with many feudal abuses, and reformed the judiciary. On the accession of Charles IX, in 1560, L'Hôpital obtained pardon for many of the condemned Huguenots, and in September, 1561, arranged the famous conference at Poissy between leading Catholic and Protestant theologians for the purpose of effecting a reconciliation between the two parties. The contending factions, however, failed to come to any agreement, and the failure of the conference only widened the breach and made recourse to arms inevitable. During the civil war that followed L'Hôpital continued his administrative reforms, and in 1566 put forth the Ordinance of Moulins, which was designed to protect the royal domains and to reform the magistracy and courts of France. Two years later the great Chancellor was forced from active office by the change in the policy of Catharine de' Medici and the hatred of the Guises and the Ultramontanes. He quitted the court in May, 1568, but it was not until Feb. 1, 1573, that he was compelled to resign the chancellorship. His honors and property were guaranteed to him for the rest of his life. He died March 13, 1573. He was an author of some note and wrote Latin verses. His works, which were published under the title *Œuvres complètes de Michel de L'Hôpital* (5 vols., Paris, 1824), edited by Dupuy de l'Yonne, contain much that is of interest for the history of France in the sixteenth century. Consult: Villemain, *Vie de L'Hôpital* (Paris, 1874); Dupré-Lasale, *Michel de L'Hôpital* (ib., 1875); Scitte, *Un apôtre de la tolérance au XVIème siècle: Michel de L'Hôpital* (Montauban, 1891); Fournier de Flaix, *L'Hôpital, son temps et sa politique* (Paris, 1900); Shaw, *Michel de L'Hospital and his Policy* (Oxford, 1905).

LHUYS, EDOUARD DROUYN DE. See DROUYN DE LHUYS, EDOUARD.

LI, lē. The name of a variable Chinese measure of length. In theory the li exists as measuring 1800 land feet (which vary in different parts of China from 8.6 to 27.8 inches). Based on the "chih," the foot of 14.1 English inches of the treaty regulations, the li equals 705 yards, or four-tenths of a statute mile. According to H. B. Morse, *The Trade and Administration of China* (p. 175, rev. ed., London, 1913), the li "is one-hundredth of the distance a laden porter will cover in a day of ten hours' marching; on the plain this would represent a third of a mile, . . . but in hilly country it varies considerably."

LIABILITY. In the broadest sense, any obligation enforceable at law or in equity, including legal obligations to perform acts other than the payment of money. The term is generally used, however, in a narrower sense as meaning a legal obligation to pay money: either a sum certain due and owing, as in the case of a debt, or an unliquidated sum, as in case of damages due upon tort or upon breach of contract. The source of all legal liability is either contract (q.v.), quasi contract (q.v.), or tort (q.v.). As a legal term, the word is not properly applicable to responsibility under the criminal law. Consult Parsons, *Law of Contracts,* and Pollock, *Law of Torts.* See CONTRACT; DEBT; EMPLOYER'S LIABILITY; JOINT LIABILITY; LIMITED LIABILITY; QUASI CONTRACT; TORT; LABOR LEGISLATION.

LIABILITY, JOINT. See JOINT LIABILITY.

LIADOV, lyȧ'dôf, ANATOLE (1855–1914). A Russian composer and conductor, born at St. Petersburg. He received his first musical education from his father, an orchestral conductor, and then entered the St. Petersburg Conservatory, where Rimski-Korsakov (q.v.) was his teacher in composition. He graduated in 1877, and the following year was appointed teacher of theory, later becoming professor. In 1894 he accepted the conductorship of the St. Petersburg Musical Society. His most important compositions are his works for pianoforte, mostly in the smaller forms and strongly influenced by Chopin and Schumann, yet with sufficient admixture of distinctive Russian characteristics to save him from the charge of being a mere imitator. He also wrote a scherzo, a mazurka, and a polonaise for orchestra, and some choral works with orchestra.

LIAKHOV, lyȧ′ᴋôf. A group of islands in the Arctic Ocean. See New Siberia.

LIANAS, lĭ-ā′na*z* (Fr. *liane*, creeper, from *lier*, to bind, from Lat. *ligare*, to bind). Plants which climb either by twining or by means of tendrils or other structures. While climbing plants are found in all parts of the world to a greater or less degree, their peculiar home is in the rich tropical forests. There they form dense jungles among the trees, in some cases making passage almost impossible. The various methods by which plants climb may be briefly mentioned. Some forms twine about the stem of the host plant, as the morning-glory and the bittersweet; others climb by means of tendrils, as the grape and the pea; still others by means of rootlets, as various ivies. Some plants which have one or more of these means for climbing also have thorns which in a measure help to secure attachment to the branches of the host; various greenbriers well illustrate this. Their advantage is clear, inasmuch as they are able to grow up to the light in a comparatively short time and at a comparatively slight cost. Lianas often show structures which seem to adapt them well to their life conditions. Among these perhaps the most conspicuous are the mechanical tissues and the conducting tissues.

LIANCOURT, F. A. F. See La Rochefoucauld-Liancourt.

LIAOTUNG, lē̇-ou′tụng′ (Chin., river east). A name originally applied to that portion of south Manchuria which lies to the east of the river Liao—that on which the port of Newchwang is situated, the portion to the west being known as Liaosi. The name now includes both and is nearly synonymous with Shingking. The term has sometimes been restricted, wrongly, to the peninsula on which Port Arthur is situated, sometimes called the Regent's Sword.

LIAO-YANG, lē̇-ou′yäng′, Battle of. See Russo-Japanese War of 1904–05.

LIAPUNOV, lyä′pụ-nôf, Sergei Mikhailovitch (1859–). A Russian composer, born at Yaroslav. He studied music at Nizhni Novgorod and at the Moscow Conservatory. After his graduation in 1883 he lived in St. Petersburg, engaged in teaching and composing. In 1893 he was ordered by the Imperial Geographical Society to collect the folk songs of several Russian provinces, and these he later helped Balakirev and Liadov (qq.v.) to harmonize. From 1894 to 1902 he was assistant director of the court chapel. Among his more important compositions are a ballad, a polonaise, a festival overture, a symphony in B minor, and a concerto for piano and orchestra. His other works include preludes, mazurkas, valses, 12 *études d'exécution transcendante* for piano, and 35 Russian national songs with piano accompaniment.

LIAR, The. A farce by Foote, founded on Corneille's *Le menteur*. It was produced in 1761.

LIARD, lyȧr, Louis (1846–). A French philosopher and educator, born at Falaise (Calvados). He taught in several lycées, was director of higher education in the Ministry of Public Instruction (1884–1902), and in 1902 was appointed vice rector of the Academy of Paris. By the furtherance of exchange lectureships he helped to strengthen the ties of scholarship between France and the United States. He became a Grand Officer of the Legion of Honor and a member of the Institute. His works include: *Des définitions géométriques et des définitions empiriques* (1873–88); *Platon, le septième livre de la République* (1875); *Cicéron: des vrais biens et des vrais maux* (1875); *Descartes: Discours de la méthode* (1877); *Les logiciens anglais contemporains* (1878–90); *La métaphysique et la science positive* (1879–1905); *Morale et enseignement civique* (1881–1905); *Descartes* (1882–1903); *Universités et facultés* (1890); *L'Enseignement supérieur en France; Notice sur la vie et les travaux de Jules Simon* (1898); *Pages éparses* (1902). After 1902 his writing, mainly on educational lines, included *Nouveau plan d'études de l'enseignement secondaire, les cadres, l'esprit* (1903); *L'Université de Paris* (2 vols., 1910).

LIAS′SIC SERIES (Fr. *lias*, OF. *liais*, *liois*, from Bret. *liach*, *leach*, Welsh *llech*, Gael., Ir. *leac*, stone). The lower division of the Jurassic system. The formation is of special importance in western Europe; in the United States Liassic rocks occur only in California and Oregon. In England the rocks comprise clays, sands, and limestones, aggregating more than 1000 feet in thickness and divisible into three stages: Lower, Middle, and Upper Lias. Fossil remains are abundant and include among the higher forms Ichthyosaurus, Plesiosaurus, Dimorphodon (qq.v.), and other reptiles. See Jurassic System.

LIBA′NIUS (Lat., from Gk. Λιβάνιος) (314–393 A.D.). One of the latest and most eminent of the Greek sophists or rhetoricians. He was born at Antioch in Syria, studied at Athens under various teachers, and first set up a school in Constantinople, where his lectures were so attractive that he emptied the benches of the other teachers of rhetoric, who had him brought before the prefect of the city on a charge of "magic" and expelled. He then proceeded to Nicomedia, but after a residence of five years was forced by intrigues to leave it and returned to Constantinople. Here, however, his adversaries were in the ascendant; hence, broken in health and spirit, he settled down in his native city of Antioch in 354, where, after a long career as a teacher, he died. Libanius was the instructor of St. Chrysostom and St. Basil, who always remained his friends, though Libanius was himself a pagan, and of Ammianus Marcellinus (q.v.). He was a warm friend of the Emperor Julian (q.v.), who corresponded with him. His works are numerous and mostly extant, consisting of orations, declamations, narratives, 1607 letters, etc. The most complete edition of the orations and declamations is that by Reiske (4 vols., Altenburg, 1784–97), and, of the letters, that by Wolf (Amsterdam, 1738). Since 1903 a new complete edition, by Förster, has been under way. No complete English translation of the works of Libanius exists, but 16 of his letters to Julian have been translated by Duncombe, *The Works of the Emperor Julian*, vol. i, pp. 303–332 (3d ed., London, 1798); the monodies *On Nicomedia* and *On the Temple of Apollo at Daphne* are published by the same author (vol. ii, pp. 227–251). Libanius' *Funeral Oration on the Emperor Julian* is translated by King, *Julian, the Emperor* (London, 1888). Consult: Petit, *Essai sur la vie et la correspondance du sophiste Libanius* (Paris, 1866); Sievers, *Das Leben des Libanius* (Berlin, 1868); J. E. Sandys, *A History of Classical Scholarship*, vol. i (2d ed., New York, 1908); J. W. H. Walden, *The Universities of Ancient Greece* (ib., 1909).

LIB′ANUS, MOUNT. See LEBANON, MOUNT.

LIBA′TION (Lat. *libatio*, from *libare*, to take a portion of, Gk. *λείβειν*, *leibein*, to pour out; the commoner Latin noun, however, is *libamentum*). Anything poured out for the gods, as an act of homage or worship; a drink offering. Such a libation was usual among the ancient Romans as a part of the sacrifice at an altar, and at home, at the beginning of meals or banquets, in homage to the *lares* (q.v.), or household gods. The term "libation" has often also a wider significance, including not only the wine poured upon the altar, but often the little sacrificial cake, *libum*, that was placed there.

LIBAU, lē′bou (Russ. *Labava*). A fortified seaport in the Province of Courland, Russia, on the Baltic. It is situated on the end of a sandy tongue of land which separates Lake Libau from the sea, through which runs the channel, dry in 1703, which divides the city into two parts (Map: Russia, B 3). Libau is well built and consists of the old and new town; in the latter, on the right bank of the channel, are the large factories, the grain elevators, mills, etc. Libau has two Gymnasia, a high school for women, a naval school, a public library, and a number of other educational institutions. It has also a large public garden. The industries, formerly unimportant, have greatly increased, the principal articles of manufacture being farm machinery, flour, timber, sails, explosives, matches, colors, soap, beer, ropes, and furniture. There is an extensive export trade in eggs, flour, flax, spirits, petroleum, horses, flax, timber, pork, and notably grain; while the chief imports are coal and herrings. Libau is connected directly by rail with the wheat regions of the Empire. At the entrance to the channel, 2 miles from the centre of the town, is the commercial or winter harbor, an artificial harbor constructed between 1893 and 1904, which is ice-free throughout the year. To the north of the town is the naval harbor of Alexander III, very strongly fortified and protected by moles and breakwaters, near which is the Orthodox Naval Cathedral, which was consecrated in 1903. Pop., 1897, 64,500; 1913, 90,400, 20 per cent being Jewish. Libau is a popular bathing resort. As a seaport, it is first mentioned in 1263 under the name of Portas Liva. It was fortified by the Livonian Knights in 1301 and passed to the possession of Russia in 1795. During the European War which broke out in 1914, Libau was several times shelled by German warships. Each time the city was set on fire and considerable shipping destroyed. See WAR IN EUROPE.

LIB′BEY, WILLIAM (1855–). An American scientist, born in Jersey City, N. J. In 1877 he graduated at Princeton, where he was assistant professor of physical geography (1882) and of histology (1883–98) and professor and director of the Museum of Geology and Archæology after 1883. He also became fellow of the Geographical and Geological societies of London and Paris and vice president of the American Society of Naturalists. He led scientific parties to Hawaii, Mexico, and Cuba, and visited Greenland in the summer of 1894 and again in the summer of 1899. He published *The Jordan Valley and Petra* (1905).

LIBBY, CHARLES FREEMAN (1844–1915). An American lawyer. He was born at Limerick, Me., graduated from Bowdoin College in 1864, and studied at Columbia Law School in 1865–66. Admitted to the bar in 1866, he practiced at Portland, Me., after 1868; was a Republican member of the Maine Senate in 1889–92 and its president in 1891–92, and became president of the Portland Railroad Company in 1904. He was president of the Maine State Bar Association in 1891–96, of the Cumberland Bar Association in 1907, and of the American Bar Association in 1909–10. From 1891 to 1912 he served as president of the overseers of Bowdoin.

LIBBY PRISON. A Confederate military prison during the Civil War, situated in Richmond, Va. It was a building three stories high in front and four in the rear, containing six rooms (excluding the cellar), each about 105 by 45 feet. Before the Civil War it was used by its owner, a Mr. Libby, as a tobacco warehouse. It was first used as a prison after the first battle of Bull Run and continued to be thus used until the close of the war. At times as many as 1200 prisoners were confined there, most of them being Federal officers. The Confederate officers in immediate charge were Major Thomas P. Turner, commander, and Richard Turner, inspector. The prisoners suffered terribly from starvation, cold, and other causes, and many died or had their health permanently shattered while in confinement. At Libby there were bathrooms, but no soap. The ventilation was good. Many attempts at escape were made, the most famous being that of Feb. 9, 1864, when 109 prisoners made their exit through a tunnel 50 feet in length, which had been laboriously excavated by a small party of men under Col. Thomas E. Rose. Of the 109, 48 were recaptured, 2 were accidentally drowned, and 59 reached the Federal lines. In 1888–89 the building was taken apart, carried to Chicago, and there reconstructed. In September, 1889, many valuable relics having been stored in it, it was formally opened as the Libby Prison War Museum.

LIBEL (OF. *libel*, *libelle*, *libeau*, Fr. *libelle*, from Lat. *libellus*, dim. of *liber*, book, inner bark of a tree). In admiralty practice, the first pleading of the complainant, which is filed in the office of the clerk of the court to commence the action. It is in the form of a petition addressed to the judge of the court by name, setting forth the nature and facts of the claim and containing a prayer that process issue in the proper manner. If the action is against an individual, a citation (q.v.) will issue directing him to appear and answer; if against a vessel or cargo, a writ issues to an officer of the court directing him to attach it, which is considered sufficient notice to the owners. The libel must be verified by the libellant, as the claimant is called, or his agent if the libellant is without the jurisdiction.

The term was borrowed from the Roman law, where a pleading known as the *libellus conventionis* was employed in certain forms of action. Thus, in course of time, the term "libel" came to designate the first pleading in an action under the civil law. It corresponds to the complaint or declaration at common law and to the petition or bill in a chancery suit. See ADMIRALTY LAW; PLEADING.

LI'BEL. A term of the common law, descriptive of that species of defamation which is committed by writing or its equivalent. It consists of the publication of that which tends to bring another into hatred, contempt, or ridicule, and is a criminal offense as well as a civil wrong. Special damage to its victim need not be shown. Nor is the truth of a libelous publication always a defense. Many of our State constitutions declare that it is not a defense to a criminal prosecution, unless published with good motives and for justifiable ends. Fair reports of legislative debates, judicial proceedings, and similar transactions, however injurious in fact, do not subject their publishers to action for libel. Various other immunities are accorded to news gatherers and publishers by modern statues.

A defamatory writing will not subject its author to an action, either civil or criminal, until it is published. For the purposes of a criminal prosecution, it is published as soon as any one knowingly exposes it to the sight of another, who is capable of understanding it. Accordingly the writer of a defamatory article may be liable criminally if he sends it in a sealed envelope to the one defamed. To render him liable in a civil action for damages, however, the writing must have been communicated to a third person; save in a few States, where the rule has been changed by statute. Such communication need not have been intentional. One who sends the writing to a third person by mistake may inflict as great an injury upon the victim of his defamation as though he had planned the injury. Nor can the publisher of a libel screen himself from civil responsibility by saying that it was a joke. In the language of a great judge, "no one can cast about firebrands and death, and then escape from being responsible by saying he was in sport."

A century and a half ago the weight of judicial authority favored the rule that the defamatory character of a publication was a question of interpretation and therefore one for the court and not for the jury to determine. Lord Mansfield's inflexible enforcement of this rule elicited much criticism and led to the enactment of a statute known as Fox's Libel Act (32 Geo. III, c. 60). This statute has generally been reenacted in the United States. Although in terms it only applies to criminal proceedings, it has been followed by analogy in civil actions for libel, and no plaintiff is entitled to succeed, either in England or in the United States, unless the jury find that the publication is libelous. In a civil action, if the judge is of the opinion that the publication complained of is not defamatory, he may, however, direct that the plaintiff be nonsuited.

Bibliography. Townshend, *Treatise on the Wrongs Called Slander and Libel* (4th ed., New York, 1890); Newell, *The Law of Libel and Slander in Civil and Criminal Cases* (2d ed., Chicago, 1898); Bigelow, *The Law of Torts* (7th ed., Boston, 1901); Pollock, *The Law of Torts* (7th ed., New York and London, 1904); Odgers, *A Digest of the Law of Libel and Slander* (4th ed., ib., 1905). See DEFAMATION; SLANDER; TORT.

LIBELT, lē'bĕlt, KAROL (1808–75). A Polish politician and author, born in Posen. He studied philosophy and mathematics in Berlin, entered the Polish Revolutionary army in 1831, and was imprisoned for nine months at Magdeburg. From 1840 to 1845 he edited at Posen two Polish newspapers, in 1845 was a member of the Revolutionary Central Committee, and in the next year was elected a member of the Provisional Government at Cracow. He was sentenced to 20 years' imprisonment for his part in this uprising, but regained his freedom after the revolution of March, 1848. He was a member of the Prague Slavic Congress, of the Frankfort Parliament of 1848, and in 1873 was elected to the Prussian Lower House. His writings include: *Filozofia i krytyka* (1845–50), Hegelian in tendency; *Estetyka* (1851); *Umnictevo* (1857), a system of ethics; *Dziela* (1875); *Zbior pism pomniejszych* (1849–51), political papers; *Dziewica Orléanska* (1847); and the sketches *Humor i pravada* (1852).

LI'BER (Lat. *Līber*). The name of a Roman deity, identified by the Romans with Bacchus. Consult W. W. Fowler, *Roman Festivals*, 54–56 (London, 1899), and Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

LIBER (Lat. *lĭber*). The ancient Latin name for a book. See BOOK; CODEX; LIBRARIES; PAPYRUS; PARCHMENT.

LI'BERA. In Roman mythology, the wife of Liber (q.v.), worshiped with him in conjunction with Ceres, and identified with Persephone. Her festival, Liberalia, occurred on the 17th of March. Consult W. W. Fowler, *Roman Festivals* (London, 1899), and Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

LIBERAL ARTS. See ARTS, LIBERAL.

LIBERA'LIA. See LIBERA.

LIBERAL'ITAS JU'LIA. See EVORA.

LIBERAL REPUBLICAN PARTY. In American history, the name given to a short-lived political party which participated in the presidential campaign of 1872, composed largely of "bolters" from the regular Republican organization. The party first appeared as a prominent political factor in Missouri in 1870, under the leadership of Carl Schurz and B. Gratz Brown, the latter of whom, by a fusion of Liberal Republicans with a large element of the Democratic party, was elected Governor. The faction here declared for "universal amnesty and universal enfranchisement," a reform in the tariff, an effective civil-service system, and a cessation of "unconstitutional laws to cure kuklux disorders, irreligion, or intemperance." As President Grant's first term drew near its close, disaffection in the Republican ranks throughout the country became increasingly pronounced, chiefly because of the President's policy of severity with regard to the Southern whites and his alleged misuse of his appointing power. In answer to a call issued by the triumphant fusionists of Missouri on Jan. 24, 1872, a National Liberal Republican Convention met at Cincinnati on May 1, and after much discussion Horace Greeley was nominated for President and B. Gratz Brown for Vice President, on a platform which, evading the tariff issue, declared for universal amnesty, the reëstablishment of civil governments throughout the South, and civil-service reform. On June 9 the Democratic Convention assembled at Baltimore formally accepted the candidates and the platform of the Liberal Republicans, though a dissenting element subsequently met at Louisville and nominated Charles O'Conor for President and John Quincy Adams for Vice President. The campaign was marked by much ill feeling and considerable personal abuse, Greeley being especially attacked because of his affiliation with the Democrats, whom formerly, as a Republican, he had consistently opposed. In the election the fusion candidates were overwhelmingly defeated, Grant, the Republican candidate, being reëlected by an electoral vote of 286 to 63. The party did not survive. Among others who had been more or less prominently identified with the party were Charles Francis Adams, Lyman Trumbull, Carl Schurz, David Davis, Stanley Matthews, Horace White, George W. Julian, and David A. Wells. Consult: J. A. Woodburn, *Political Parties in the United States* (New York, 1903); S. D. Fess, *History of Political Theory and Party Organization in the United States* (Boston, 1910); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. ii (New York, 1914).

LIBERAL UNIONISTS. A political party formed in Great Britain in 1886 through a division in the Liberal party. It was headed by Lord Hartington, Joseph Chamberlain, and G. O. Trevelyan, and was composed of those Liberals who thought that the Empire should be preserved "compact and complete." The division then took place upon the introduction of the Home Rule Bill by Mr. Gladstone. For a number of years after their secession the Liberal Unionists maintained their separate organization and claimed to stand for distinctive principles. But they have since, for all practical purposes, become merged in the Conservative party. Consult West Ridgeway, "The Liberal Unionist Party," in the *Nineteenth Century* (London, August and October, 1905).

LIB'ERATOR, The (Sp. *El Libertador*). A name applied to the South American patriot Bolívar.

LIBERATOR, The. An antislavery journal founded in 1831 by William Lloyd Garrison. It was published until 1865.

LIBERATORE, lē-bȧ'rȧ-tō'rȧ, Niccolò di. See Niccolò da Foligno.

LI'BER DIUR'NUS RO'MANO'RUM PONTIF'ICUM (Lat., Journal of the Roman Pontiffs). The title of a collection of formulas used in the papal chancery from the fifth to the eleventh century in preparing certain documents, e.g., when sending the pallium, granting special privileges, papal appointments, etc. Owing to altered conditions, it was no longer useful and so was laid aside and after a time forgotten. When manuscript copies were discovered in Rome and elsewhere in the seventeenth century, preparations were made for printing it, but the censorship refused permission; and though it was printed in Paris by the Jesuit Garnier (1680), the first official edition came out under the auspices of Benedict XIII in 1724. The best edition of the Vatican manuscript is that of T. E. von Sickel (Vienna, 1889). The Milan manuscript, discovered after the printing of Von Sickel's edition, was edited by Ratti (Milan, 1891).

LIBE'RIA (Neo-Lat., from Lat. *liber*, free). A negro republic of West Africa, lying on the Atlantic shore between Sierra Leone on the west and the Ivory Coast on the east (Map: Africa, D 4). The coast line is about 350 miles long, extending from the Mano to the Cavally. The area is estimated at 40,000 square miles. The boundaries were not fixed with England and France until 1885 and 1892, that part of the interior which drains into the Niger having finally, in the latter year, fallen to France. Only the coast strip, with an average width of 7 miles, is developed and administered. It is swampy and flat. The interior is elevated and clothed with valuable forests of gum trees, oil palms, and pepper shrubs. The hill land is healthful and naturally productive and is the abode of elephants and buffaloes. Among the numerous rivers—all comparatively small—are St. Paul's (supposed to be 200 miles long and navigable for 25 miles), St. John's, and Cestos. Many metals have been found, and the republic is supposed to be rich in them, but as yet they have not been found in payable quantities. The climate has been called the hottest known on the globe, but is not considered so dangerous to white men as that of Sierra Leone. January is the warmest month. There are two rainy seasons, yielding over 150 inches of rain per year—one in June and July, the other in October and November.

The soil along the coast is very rich, but in general cultivation is neglected. The staple product is coffee. Mining and industrial development has scarcely begun. There are several American, English, and German factories, or trading stations. Foreign commerce is not in a flourishing condition. In 1910 imports were valued at $1,667,857 and exports at $1,199,152. The chief exports are palm oil, piassava, palm kernels, rubber, and ivory. About 70 per cent of the trade was with Germany.

The constitution is framed after that of the United States. The executive authority is vested in a President and Vice President (elected for four years) and a council of six members. The legislative power rests with a Congress of two houses—the Senate (8 members) and the House of Representatives (14 members). Voters must be of negro blood and own real estate. The natives generally do not avail themselves of the suffrage. No foreigner can own land without the consent of the government. The coast territory is formed into the counties of Bassa, Maryland, and Sino, with one superintendent each, and Montserrado, with four superintendents. The capital is Monrovia (named after President Monroe of the United States). The estimated revenue for 1914 was $531,500. Revenue and expenditure in 1902 were $310,000 and $318,110 respectively; in 1911–12, $471,335 and $470,000. The revenue is derived mainly from customs duties. A debt of £100,000 was contracted in 1871; the unpaid interest in 1910 amounted to £185,000. The internal debt on Jan. 1, 1914, was $200,000; the total public debt (including those just mentioned and others) on that date was $1,352,000. In 1911 a plan was agreed upon, with the approval of the United States, Great Britain, France, and Germany, whereby Liberian finance should be administered by an American controller and British, French, and German subcontrollers. The plan involved the raising of an international loan of £500,000, secured by the customs, head tax, and rubber tax. It was also provided that the Liberian army be reorganized by American officers to assure the maintenance of peace. British money is used, but American money figures usually in the keeping of accounts. There is a Liberian coinage and a rather large paper currency. The weights and measures are, as a rule, British. The official language is English.

Defense. All able-bodied men between the ages of 16 and 50 are liable for military service. The active military forces consist of militia, volunteers, and police, the total force being estimated at about 400 men. Under an agreement between the United States, France, Germany, and Great Britain (1911), the United States designated an officer of its army to organize a frontier police to maintain peace and provide for the security of the revenues.

The population is estimated to be about 2,000,000, some, however, putting it much lower. There are supposed to be from 12,000 to 15,000 Americo-Liberians. Besides these there are in the coast region some 40,000 civilized and christianized natives, mostly Episcopalians. The indigenes are chiefly as follows (with allied tribes): Mandingo (Mohammedan), Kisi, Vai, Kpwesi, Gora, and Kru. In 1910 there were 113 public primary schools, with 4100 pupils. There are reported 87 mission schools, with about 3000 pupils. A few institutions exist for more advanced education, including a government college, with about 120 students. The experiment of negro self-government in Liberia cannot yet be pronounced a success.

History. The State of Liberia owes its origin to the efforts of the National Colonization Society of America (see COLONIZATION SOCIETY), organized in 1816 to colonize in Africa the free people of color in the United States. The first attempt to locate, which was made in Sherbro Island south of Sierra Leone (1820), because of the excellent harbor there, failed because of the unhealthfulness of the locality; but in December, 1821, a treaty was concluded by Lieutenant Stockton with certain native princes, by which a tract of land fit for the purpose was acquired about Cape Mesurado. It was some weeks before the hostility of the natives, who were wedded to the slave trade, could be overcome, but in April, 1822, active operations were begun on the mainland. A 30-acre tract was allotted to each man, with the means of cultivating it. The society's agents became discouraged at the difficulties that were met and returned to America with a few faint-hearted ones; but the others rallied about a determined negro, Elijah Johnson, and remained. The colony was enlarged by the purchase of new tracts. New settlements were afterward formed at Cape Monte and in the newly acquired Bassa Land, in which, in 1834, a town was founded, and called Edina, in acknowledgment of pecuniary aid sent to the colony from Edinburgh. Many of the neighboring chiefs were received into the colony, and others were subdued. Trials of many kinds, deprivations, and dissensions, were the lot of the colony, managed by a society which did not fully know whether its aims were sentimental or practical. In 1847 Liberia was left to its own resources and declared an independent republic and recognized as such by most of the important countries in the world. The colony began to show more prosperity; numerous churches and schools were founded, a regular postal system was introduced, newspapers were established, and slavery in the neighboring states was abolished. Conventions in 1885, 1892, and 1903 with Great Britain and France defined minutely the boundary between Liberia and their colonial possessions. In 1909 President Roosevelt appointed a commission to investigate the general status of affairs in Liberia. As a result, it was announced in the following year that the United States, acting in harmony with Great Britain, France, and Germany, would hereafter supervise military, financial, boundary, and agricultural questions in the negro Republic. A $2,000,000 loan was floated by an Act of the Legislature in 1911. Mr. Daniel Howard was elected President in 1912. He immediately got into difficulty with Germany because of insults offered to merchants. Two German gunboats forced an apology. Liberia retaliated by granting privileges to English traders in 1913.

Bibliography. Hutchison, *Impressions of Western Africa* (London, 1858); Valdez, *Six Years of a Traveler's Life in Western Africa* (ib., 1861); Stockwell, *The Republic of Liberia: Its Geography, Climate, Soil, and Productions* (New York, 1868); Johnson, *The Independence of Liberia* (ib., 1882); Wouvermans, *Liberia, histoire de la fondation d'un état nègre libre* (Brussels, 1885); Dutry, *Liberia, son histoire, sa constitution et ses resources* (Ghent, 1887); Bourziex, *La république de Liberia* (Paris, 1887); Buttikofer, *Reisebilder aus Liberia* (Leyden, 1890); McPherson, "History of Liberia," in *Johns Hopkins University Studies, No. 10* (9th series, Baltimore, 1891); Blyden, *A Chapter in the History of Liberia* (Freetown, 1892); Durham, *The Lone Star of Liberia* (London, 1893); Delafosse, *Un état nègre: La république de Liberia* (Paris, 1900); Sir H. H. Johnston, *Liberia, with an Appendix on the Flora of Liberia by Otto Stapf* (2 vols., New York, 1906), which is the best book yet written on the country; and Wallis, "A Journey through the Liberian Hinterland," in the *Geographical Journal* (1910).

LIBE'RIUS. Pope, 352–66. He was born in Rome, but nothing is known of his history prior to his pontificate, which fell in the stormiest period of the semi-Arian controversy. (See ARIUS.) The Emperor Constantius supported the semi-Arian party with all his authority; and the Council of Aries in 353, and that of Milan in 355, formally condemned Athanasius (q.v.), the great representative of the orthodox belief. Liberius refused to confirm this decree. He was in consequence deposed and banished to Berœa by the Emperor, who caused a Roman deacon, Felix, to be elected in his stead. He was restored to his see in 358, but the terms on which he was recalled are much disputed. He survived his return from exile eight years and died in high repute for sanctity at Rome, Sept. 24, 366. In the traditions of the sixth or seventh century the relations between Liberius and Felix were completely reversed, and Liberius was made out to be an antipope, a heretic, and a tyrant. The only remains of Liberius are some letters preserved by Constant in the *Epistolæ Romanorum Pontificum* (Paris, 1821), reprinted in Migne, *Patrol. Lat.*, viii, German translation in *Bibliothek der Kirchenväter* (Kempten, 1876). In the Greek church Liberius is commemorated on August 27; in the Latin, on September 23. Consult Döllinger, *Pabstfabeln* (Munich, 1890).

LI'BER PON'TIFICA'LIS (Lat., pontifical book). A history of the bishops of Rome beginning with the Apostle Peter and extending to

Nicholas I (867), with an addition subsequently made of the times of Adrian II and Stephen VI (891). Anastasius, librarian of the Church under Nicholas I and abbot of a convent in Rome, was formerly supposed by many to be the author of the book; but later investigations have shown almost certainly that it existed before his time. The oldest materials now known that were used in the compilation of it were furnished by a list of the popes down to Liberius, which was probably written before his death (366). The original manuscript has been lost, but several copies of it, taken in the seventeenth century from other copies, are extant. Another list of the popes comes down to Felix IV (530). Parts of it are almost literal copies from the former, but many additional particulars are given, drawn from various sources and having different degrees of historical value. Both lists were afterward continued and ultimately formed the Liber Pontificalis, the oldest-known copy of which belongs to the end of the seventh or the beginning of the eighth century. A first continuation of it extends to Gregory II, who became Pope in 714, and a second ends with Stephen III (757). After this time several other continuations were made, the latest of which terminates, as has been mentioned, with Stephen VI (891). Besides the sources already spoken of, materials for the history were furnished by traditions, written documents, buildings, inscriptions, and other monuments. Additions to the book have been made: 1. By three histories of the popes, the authors of which are not known, (*a*) from Lando (913) to Gregory VII (1073) and belonging to the eleventh century; (*b*) extending down to the same date and written during Gregory's life; (*c*) from Paschal II, in the early part of the twelfth century. 2. By a history written in the thirteenth century, extending from Gregory VII to Honorius II (1129). 3. By histories originating at the close of the twelfth century. The text is published in Migne, *Patrol. Lat.*, cxxvii, cxxviii (under Anastasius), but much better by L. Duchesne (2 vols., Paris, 1884–92), and by Mommsen in *Monumenta Germaniæ Historica* (Berlin, 1898 et seq.).

LIBER STU′DIO′RUM (Lat., book of studies). A set of prints from engraved plates prepared by J. M. W. Turner from his own designs and published in parts between the years 1807–16. The intention was, probably, to issue 100 plates, but only 71 were published, of which number one, the frontispiece, did not appear until several years after the commencement of the work and was then presented to the subscribers. More plates had been prepared, and prints from some of these are accessible. They are called "the unpublished plates" and are of very great value. The first scheme seems to have been to use aquatint (q.v.) for the plates, with a skeleton or substratum of etched outline by Turner's own hand. The great majority of the plates are, however, in mezzotint, done by Charles Turner, T. Hodgetts, G. Clint, Thomas Lupton, and others; and the etching of each plate was in nearly every case by the designer himself, J. M. W. Turner. These etchings are generally of the most extraordinary merit and interest, and copies of them are greatly in demand. A very few of the plates are entirely in mezzotint, and by Turner himself, and these are of especial and peculiar importance to the student of landscape art. Single prints in the first state are quoted at several hundred dollars. A complete set in the finest condition may be worth $10,000. The biographies of Turner treat of *Liber Studiorum*, as it forms an important episode in the early prime of the artist's life.

Bibliography. Good special commentaries are: Pye, *Notes and Memoranda Respecting the Liber Studiorum of Turner* (London, 1879); Brooke, *Notes on the Liber Studiorum of J. M. W. Turner* (ib., 1885); W. G. Rawlinson, *Turner's Liber Studiorum: A Description and Catalogue* (2d ed., London, 1907); *Liber Studiorum*, with introduction by C. F. Bell (New York, 1911); also the interesting discussion in W. Armstrong, *Life of Turner* (London, 1902).

LIBERTAD, lē ʙâr-täᴅ′. A maritime department of Peru, bounded by the departments of Lambayeque, Cajamarca, and Amazonas on the north, Loreto on the east, Ancachs on the south, and the Pacific Ocean on the west (Map: Colombia, B 5). Its area is estimated at over 10,200 square miles. A large part of the surface is occupied by the Andes. The strip along the coast is dry and low. The eastern part is crossed from south to north by the upper course of the Marañon (Amazon). Some of the valleys in that part of the department are very fertile. Agriculture and stock raising are carried on to some extent. Mineral deposits are supposed to exist in the mountains, but mining is neglected. Pop. (est.), 250,000. The capital is Trujillo (q.v.).

LIB′ERTIES, The. The name given to a district of Dublin, Ireland, formerly the home of citizens holding certain privileges. It contained many magnificent residences, but is now occupied by the poorer classes.

LIB′ERTINES (Lat. *libertinus*, relating to a freedman, from *libertus*, freedman, from *liber*, free), Synagogue of the. A synagogue at Jerusalem, mentioned in Acts vi. 9: "Then there arose certain of the synagogue, which is called the synagogue of the Libertines, and Cyrenians, and Alexandrians, and of them of Cilicia and of Asia, disputing with Stephen." The expression is taken by most scholars to mean a synagogue of freedmen, referring to Jews who had been taken captive by Pompey, carried to Rome, and afterward set free, and whose descendants may have returned to Jerusalem and formed, either alone or with other Jews, a synagogue there. A geographical term, however, would suit the context better in view of the four other geographical names. And in view of the African names Alexandria and Cyrene, it would seem that an African name should head the list. The reading *Libystines* has been suggested as the original reading, which was easily corrupted into *Libertines*. This suggestion finds some support in an Armenian version which reads "of Libyans." If this plausible suggestion be accepted, the passage refers probably to two synagogues—one made up of African Jews from Libya, Cyrene, and Alexandria; the other made up of Jews from Cilicia and Asia. Consult Friedrich Blass, *Philology of the Gospels* (New York, 1898).

LIBERTINES, The, or Spiritualists. 1. An odious and pernicious sect that sprang up in the sixteenth century in the Reformed church of France. They arose in Flanders about 1525, perhaps as a recrudescence of the ancient Beghards (see Beguines) and Brothers and Sisters of the Free Spirit (q.v.). They are said to have made 4000 proselytes in France alone, and not only among the lower classes but also among the higher and learned. They obtained the favor and protection of Margaret, Queen of Navarre, sister to Francis I, and found patrons in several of the Reformed churches. They called themselves Libertines and Spiritual Brethren and Sisters. Their system was pantheistic and antinomian. From being a mere dogma, it degenerated into open and avowed sensualism. Calvin sternly denounced their principles, and the sect left France, took refuge in the Netherlands, and at last entirely disappeared. 2. A party in Geneva, opponents of Calvin, were also called Libertines, but they had only the name in common with the above. These Libertines were in general the opponents of the policy and theology Calvin strenuously enforced and defended; but they were formidable enough to raise an insurrection in Geneva on May 15, 1555. Their leaders being exiled or imprisoned, the power of the party was broken. 3. This name in England was given to the early Anabaptists about the middle of the sixteenth century. See ANABAPTISTS.

LIBERTI'NUS, LIBER'TUS (Lat., from *liber*, free). Names given by the ancient Romans to the manumitted slave. See MANUMISSION; SLAVERY.

LIB'ERTY. A city and the county seat of Clay Co., Mo., 14 miles northeast of Kansas City, on the Chicago, Burlington, and Quincy, the Chicago, Rock Island, and Pacific, the Kansas City, Clay County, and St. Joseph, and the Chicago, Milwaukee, and St. Paul railroads (Map: Missouri, B 2). It is the seat of the Liberty Ladies College (nonsectarian), opened in 1890, and of the William Jewell College (Baptist), opened in 1849, and contains a Carnegie library and an Odd Fellows Home. The city has considerable trade in the farm produce and live stock of the adjacent region, and some manufactures, principally of flour and vacuum cleaners. The water works and sewer system are owned by the municipality. Pop., 1900, 2407; 1910, 2980.

LIBERTY, CLAIM OF. See CLAIM.

LIBERTY, RELIGIOUS. The inherent right of the individual to form his religious opinions according to the dictates of his own conscience, and to give outward expression to them in the form of public worship independently of all restraint or coercion upon the part of the state. It includes more than mere freedom of conscience, which in reality is beyond the control of the civil power. It includes also more than mere toleration, which simply concedes for the time the right of the individual to worship as he pleases—a concession which implies the superiority of an established church, and which may be withdrawn at the will of the sovereign granting it. Religious liberty implies the equality of all in the matter of worship, while the principle upon which toleration is granted denies this idea. Religious liberty is frequently characterized as one of the absolute, inalienable, or natural rights of the individual, while toleration is a concession emanating from the benevolence of the sovereign.

Among the nations of antiquity the idea of religious liberty was almost totally lacking. In Egypt, Assyria, Babylon, Persia, and Syria, the individual was subject to the will of the King in religious as in civil matters. In the Roman Empire worship of the state religion was obligatory upon every subject. The Christian religion was tolerated merely by many of the emperors during the early centuries of the Christian era. There were spasmodic persecutions by Nero, Domitian, Hadrian, and others; but it was not until the reign of Diocletian that a determined effort was made to exterminate the Christian religion. By his order all Christian assemblies were forbidden, all churches were to be destroyed, all Christian books to be burned, and all Christians who refused to adopt the state religion were to suffer death. Early in the fourth century a formal act of toleration was granted to the Christians by the Emperor Galerius, but it was expressly enacted that they were to respect the religion of the state. This was soon followed by the conversion of the Emperor Constantine, and his promulgation, in 313, of the celebrated Edict of Milan, which granted the fullest toleration of religious worship to all persons. This was shortly followed by an edict prohibiting heathen worship and establishing Christianity as the state religion of the Empire.

Throughout the Middle Ages the question of religious liberty scarcely arose. The teachings of the Roman Catholic church were unquestioned and its authority universally recognized in most of the countries of Europe. But when the Albigenses in southern France refused to accept the Catholic doctrines, they were condemned as heretics and the sect exterminated. To prevent recurrences of a similar kind, decrees were issued by the sovereigns of western Europe against all who refused to accept the Christian faith as understood by the Catholic hierarchy. Where the domination of the papal authority was displaced, as in England under Henry VIII, it was superseded by the royal authority, not less intolerant. Thus, we find Henry VIII persecuting those who, on the one hand, acknowledged spiritual allegiance to the Pope and those, on the other hand, who, while acknowledging Henry's supremacy as head of the English church, yet denied certain of the Roman dogmas. Nor did the Reformation introduce the principle of religious liberty into Europe. For, while the Protestant denied the authority and much of the doctrines of Rome, he nevertheless insisted upon unity of faith as essential to the integrity of the state. According to the maxim *Cujus regio, cujus religio*, it was the right and duty of the prince to choose a religion for his subjects and require them to worship it. It followed that it was his duty to root out heresy and punish Nonconformists. Thus, Servetus was burnt at the stake in Geneva, which was under Calvin's control, for denying the doctrine of the Trinity; the Covenanters were hunted down and slain because they could neither accept Episcopacy nor the National Kirk; and the Pilgrims emigrated to the wilds of America because they would not conform to the Anglican faith. The theory which then obtained was that, religion and morality being the basis of the state, it became the first duty of a wise prince to establish a national religion, and it was believed that the existence of two religions in the state would endanger its security.

Strangely enough, those who fled to America to escape religious persecution brought with them the Old World ideas of religious intolerance. Everywhere in New England except in Rhode Island dissent from the "established order" of worship was looked upon as sedition against the state and sin against God. Jesuits, Baptists, and Romish priests were punished by imprisonment or banishment, while several Quakers were publicly hanged on Boston Common. Practically the same policy was followed in the colonies planted in the South. The Puritan insisted upon conformity because he wished to make the state a religious unit; the Cavalier required it because the Church was a part of the civil polity. In the Colony of Rhode Island state and church were absolutely divorced from the first, and the individual left entirely to the teachings of his own conscience. In the Catholic Colony of Maryland religious toleration existed for a while, except as to Jews, Mohammedans, and other non-Christians; but eventually the Church of England was established by law. In New York and New Jersey strenuous efforts were made by the English authorities to impose the Church of England in place of the Dutch Reformed church, but without success. In Georgia liberty of worship existed until near the Revolution, when the Church of England was established as the state religion. In Pennsylvania and Delaware, as in Rhode Island, no state church ever existed.

The framers of the Federal Constitution inserted a provision in that instrument declaring that no religious test should ever be required as a qualification to any office or public trust under the United States. Doubtless they had in mind the celebrated Test and Corporation acts of the Stuarts, enforced in all the Colonies except Rhode Island and in some of them down to the Revolution. Even in tolerant Pennsylvania all public officers had to declare and subscribe to their disbelief in transubstantiation, the adoration of the Virgin Mary, and the sacrament of the Romish mass as superstitious and idolatrous. There was considerable opposition to the adoption of the Federal Constitution on account of its lack of a provision excluding non-Christian sects from the right to hold office, and also of a provision prohibiting Congress from creating a state religion; and the first amendment to the Constitution was one prohibiting Congress from making any laws respecting an establishment of religion or prohibiting the free exercise thereof. The States, however, were left free to establish a church and restrict religious worship as they saw fit. As a matter of fact, all of the States which maintained established churches during their colonial existence have disestablished them and inserted in their constitutions provisions granting religious liberty. A complete divorce of church and state was not accomplished in some of the Commonwealths until after the adoption of the Federal Constitution. It came finally in Virginia through a decision of the Court of Appeals in 1840; in Delaware and Connecticut through the adoption of new constitutions in 1818 and 1831; in Massachusetts through an Act of the Legislature in 1833; in Pennsylvania and South Carolina through the adoption of new constitutions in 1790; in Vermont and New Hampshire through acts of the Legislature passed in 1807 and 1819. At the present time 26 of the State constitutions declare it to be the privilege of "every man to worship God according to the dictates of his own conscience." Eleven declare that the "free enjoyment of religious sentiment and forms of worship shall ever be held sacred." Five make it the duty of the Legislature to pass laws for the protection of religious freedom. Nineteen declare that "no human authority ought to control or interfere with the rights of conscience," while nine ordain that "no person may be molested in person or estate on account of religion." Most of the State constitutions forbid compulsory attendance or support of any church; many of them forbid the appropriation of money for the support of sectarian institutions, although New Hampshire, Massachusetts, and Missouri allow the parishes to provide for the support of religious teachers; while nearly all in one form or another forbid religious tests for office. Curiously enough, however, eight States, some of which forbid religious tests, disqualify from public office all who deny the existence of a Supreme Being or a future state of rewards and punishments.

While almost complete liberty of worship now exists in the United States, it is recognized that religious liberty, like the liberty of the press and speech, may be abused to the injury of others and the detriment of the public morals. Thus, the constitutions of many of the States provide for a guarantee against abuse by declaring that liberty of conscience shall not be construed to excuse acts of licentiousness or justify practices inconsistent with the peace and safety of the State, and the Supreme Court has held that liberty of worship as understood in the United States extends only to relations between the individual and an extramundane being, and not to relations among individuals themselves. On this ground the court held that a law of Congress prohibiting the practice of polygamy was not an infringement of religious worship.

The influence of the American idea of religious liberty has been very powerful over Europe and elsewhere. In France different religious denominations are treated equally, all receiving state aid. In Germany liberty of worship is allowed subject to certain restrictions upon the right of assembly. In England the Anglican church is still the established faith, but religious tests for office, except in the case of the crown, have been abolished.

LIBERTY (OF. *liberte*, Lat. *libertas*, from *liber*, free), STATUE OF. A colossal bronze statue executed by Frédéric Bartholdi, a French sculptor, and presented to the people of the United States by the people of France. It stands on Bedloe's Island in New York Harbor. The gift was designed to commemorate the hundredth anniversary of American independence. It was, however, not placed in position until 1885, and it was dedicated Oct. 23, 1886. The statue represents a female figure holding a torch aloft and is of most impressive aspect to ships entering the harbor. It is the loftiest statue in the world. The figure measures 111 feet in height, and to the extremity of the torch 151.41 feet. The torch is 305 feet, 11 inches above mean tide. Forty persons can stand within the head, to which there is access by a staircase inside of the statue; a branch staircase leads into the extended arm. The torch is equipped with a very powerful electric light. The foundation was contributed by subscription among the American people.

LIBERTY BELL. The bell which first rang to celebrate the adoption of the Declaration of Independence, July 4, 1776. It was brought to Philadelphia from England in 1752 and was recast in April and again in June, 1753, when the words "Proclaim liberty throughout all the land, unto all the inhabitants thereof" (Lev. xxv. 10) were inscribed on it. For many years it was rung annually on the Fourth of July, but on July 8, 1835, while being tolled in memory of Chief Justice Marshall, it was broken. It now hangs in the hallway of the old State House in Philadelphia.

LIBERTY BOYS. A familiar name for the Sons of Liberty of the American Revolution.

LIBERTY CAP. A conical, close-fitting cap with the top drooping forward, sometimes known as the Phrygian cap from the fact that such a headdress was commonly worn by the ancient Phrygians. A cap of this sort was a token of freedom among the Greeks and Romans, and the placing of it upon the head of a slave was one of the ceremonies attending his manumission. The murderers of Cæsar carried through the streets a liberty cap on the end of a pole; and coins were stamped with a cap between two daggers at the command of Brutus and Cassius. The symbol was also adopted in the Netherlands at the time when they threw off the yoke of Spain: but it is most famous—as the *bonnet-rouge* of the revolutionists—for its connection with the French Revolution. Louis XVI, on June 20, 1792, was forced to put it on his head as a token of his sympathy with the popular demands. In August of the same year it was officially adopted as the badge of a "patriot." The cap has also appeared on the head of the Goddess of Liberty or on a pole by her side on some of the coins of the United States, and it appears in the coats of arms of several foreign countries.

LIBERTY, EQUALITY, AND FRATERNITY. The watchword of the French Revolution, denoting the salient principles of the teachings of the social philosophers of the eighteenth century. The phrase may be conceived as the political confession of faith of the first French Republic, and lay at the basis of its institutions in much the same sense as the similar phrase in the Declaration of Independence underlies the recognition of the sovereignty of the people in the Constitution of the United States. See Natural Law.

LIBERTY HALL. The name given by Squire Hardcastle to his house in Goldsmith's *She Stoops to Conquer*, and a proverbial term for a house where guests are free to follow their own inclinations.

LIBERTY OF THE INDIVIDUAL. Individual liberty has reference to a sphere of action in which the individual is referred to his own will so far as the limitations of government are concerned. Viewed from one side, it consists of *immunities* or exemptions from the operation of governmental power; looked at from the other side, it consists of positive *rights* which it is the duty of the government to enforce and protect. While the content of individual liberty varies among races, the Western nations have reached a substantial consensus in regard to its essentials. It now generally includes freedom of person and of property, freedom of conscience and its expression, freedom of opinion and its expression, subject to the restrictions everywhere imposed by the law of libel and slander, and equality before the law. Besides this sphere, which is now practically universal, a still wider realm of liberty has been created in many states and is embodied in their constitutions. In the Constitution of the United States it includes the right of assembly for the purpose of petitioning the government for redress of grievances, the right of bearing arms, immunity from the quartering of soldiers in one's house, immunity from unreasonable searches, immunity from prosecution by the government except in accord with usages and procedure which have been in common use from time immemorial. In states having the federal system of government it is necessary to provide a double sphere of liberty for the individual—one against the operation of the general government and one against the operation of the local governments. In the United States the great source of individual liberty is the Constitution. In fact, the American Constitution is quite as much an instrument of liberty as of government. The national Constitution and all of the State constitutions, with one or two exceptions, have elaborate bills of rights in which a sphere of liberty is marked out and upon which the government is forbidden to encroach or to permit any individual to encroach. The same feature appears in modified form in the German Imperial, the Swiss, and the Prussian constitutions, but not in the constitution of the French Republic or those of the remaining European states. The chief guarantee of individual liberty in the United States is the power of final interpretation of the Constitution by the Supreme Court, and the power of Congress to impeach and remove all civil officers of the United States.

LIBERTY OF THE PRESS. In English and American law, the right of printing and publishing what one will, subject only to the penalties of the ordinary law of the land for making an improper use of the liberty. These legal restrictions are (1) that the publication shall not be libelous, (2) that it shall not be such as to incite to sedition or treason, and (3) that it shall not be blasphemous. From this it will be seen that there is no such thing as liberty of the press in the broad sense in which the phrase is popularly understood. The unrestricted right of the citizen to say and publish whatever he pleases without fear of legal penalties, affirmed in the French constitution of 1791 (Tit. I) and in the present constitution of Belgium (Art. 18), has never in fact existed anywhere. The provision of the American Constitution (Amdts., Art. I) which forbids Congress to make any law "abridging the freedom of speech or of the press," does not exempt citizens from the penalties of the ordinary law either of the United States or of the several states for an abuse of the liberty. Its only effect is to preclude the enactment of laws setting up a censorship or permitting the suppression of newspapers or other publications, and this is, indeed, the sense in which the expression "liberty of the press" is to be understood. The liberty is a liberty to publish what one will and take the consequences, and these consequences are to be determined, not by any arbitrary administrative authority nor by any special tribunal under special "press laws," but by the ordinary law of the land administered by the ordinary tribunals of justice. The distinction, then, between governments which do and those which do not concede full liberty of discussion in what may be called the Anglo-American sense is that the former exercise no supervision over the publication of opinion, while the latter do. The actual liberty of expression in the sense of freedom from punishment for its exercise need be no greater in the one case than in the other, though in practice it has been found that the power of suppressing opinion by censorship or otherwise is more likely to be abused by a government, i.e., more likely to be arbitrarily and rigorously exercised, than the power of punishing for an abuse of the privilege. Accordingly the liberty of the press has been much more of a reality in England and the United States, imperfect as it still is even in those countries, than in countries where the policy of suppression prevails. This policy prevailed in France, notwithstanding the brave words of the constitution, till 1881, when the last press law was repealed, and it still obtains in most other continental countries. Even in England the policy of governmental restriction persisted till the eighteenth century. In the two preceding centuries printing was a government monopoly or a privilege granted to certain licensed individuals and practiced under regulations put forth by the Star Chamber. The censorship surviving the fall of the Star Chamber was legalized by Act of Parliament in 1662 (13 and 14 Car. II, c. 33) and was not abolished till 1695. "In England, as on the Continent, the book-trade was a monopoly, the censorship was in full vigor, the offenses of authors and printers were treated as special crimes and severely punished by special tribunals."

Most governments, even of highly civilized states, are still under the influence of the notion, which was once universal, that the free expression of opinion is incompatible with the safety and good order of the state and that these require the suppression of free criticism of the government or of ruling persons, as well as of news which might have the effect of exciting or agitating the public mind. This attitude has gradually been modified by the growing conviction that an intelligent and informed public opinion is less dangerous to the state than an ignorant one and that the intellectual and moral loss resulting from the suppression of free criticism and discussion of public affairs and the free expression of opinion outweighs the dangers of publicity.

As has been said above, the best examples of liberty of the press are furnished by England and the United States, where the question of an alleged abuse of the liberty is tried by the ordinary law and by the ordinary process of the courts. As this process involves the trial by a jury of the question of fact involved, we have the situation, summed up by an eminent legal authority: "Freedom of discussion is, then, in England little else than the right to write or say (i.e., to publish) anything which a jury, consisting of twelve shopkeepers, think it expedient should be said or written. Such 'liberty' may vary at different times and seasons from unrestricted license to very severe restraint, and the experience of English history during the last two centuries shows that under the law of libel (to which may be added that of treason and of blasphemy) the amount of latitude conceded to the expression of opinion has, in fact, differed greatly according to the condition of public sentiment." (A. V. Dicey, *The Law of the Constitution.*) Such is the liberty of the press in ordinary times. In time of war, however, or of widespread sedition, the right is much restricted. Whenever in a civilized state a state of siege or martial law (state of war, *Kriegeszustand*) has been proclaimed and the ordinary jurisdiction of the courts superseded by military law, liberty of the press, along with the other personal rights secured to the individual by the ordinary law, disappears. The censorship of the press, which was so drastically enforced in England as well as in continental countries during the war that began in 1914, and the suppression of newspapers publishing criticisms of governmental action or unauthorized news, are the usual incidents of such a situation. *Inter arma leges silent.* See LIBEL; NEWSPAPER.

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LIBERTY PARTY. A political party which existed in the Northern States of the American Union from 1839 to 1848 and was the first regular organization that attempted to oppose slavery by political means. The abolitionist followers of William Lloyd Garrison (q.v.) had adopted the doctrine of nonparticipation and nonresistance. With this policy the practical antislavery men were not satisfied, and after seeing the futility of their attempt to make their influence felt by interrogating candidates for office as to their position on the slavery question, they concluded that a party organization was the only rational means of accomplishing anything of value. This view, particularly strong in western New York, Ohio, and Michigan, found perhaps its ablest advocate in Myron Holley, who at a meeting of the American Antislavery Society in vain introduced and advocated a resolution declaring that "it was time to form a new political party" and proposed the nomination of candidates for the presidency and vice presidency. Within a month (Nov. 13, 1839), at a local convention at Warsaw, N. Y., Holley was instrumental in securing the nomination of James G. Birney (q.v.) and Francis J. Lemoyne as candidates for President and Vice President respectively. A "national" convention, composed mostly of New York delegates, and held at Albany, April 1, 1840, confirmed Birney's nomination, nominated Thomas Earle for Vice President, and adopted the name of Liberty party. But the enthusiasm of the "Tippecanoe and Tyler too" campaign retained in the Whig ranks most of those whose antislavery views might otherwise have led them to support the new party's ticket; and despite the fact that an active campaign was carried on, the ticket polled a total of only 7059 votes, 2798 of which were cast in New York. Disappointing as was the result, the Liberty party leaders did not lose heart, but at once set about preparing for the campaign of 1844. On May 12, 1841, the first really national convention of the party was held in New York, in which all the New England States, New York, Pennsylvania, New Jersey, Ohio, and Indiana were represented. Birney and Thomas Morris were nominated as the party's candidates for 1844, and a complete national organization was planned. The party at this time was made up of the more moderate abolitionists, who held that the Constitution gave the general government no power to abolish slavery in the States, and proposed only its abolition in the District of Columbia and the Territories, through Federal action, leaving the several States to act as they could be persuaded. The next convention was held in Buffalo on Aug. 3, 1844. A slight movement within the party favorable to Clay, who had pronounced against Texan annexation on the ground that it would involve the United States in a war with Mexico, was checked by the publication of a letter written by Clay in which he had said that he would "be glad to see" Texas annexed some day. The Liberty men were moreover strongly opposed to Clay personally. This turned the scale, and the nominations of Birney and Morris were confirmed. At the ensuing election the Liberty party polled 62,300 votes, 15,812 of them in New York, almost all of them drawn from the Whig party. The loss of these votes assured the election of Polk and Clay's defeat. Clay's chances were injured outside the Liberty ranks by his equivocal attitude on the annexation of Texas. The first actual effects of the Liberty party's action, therefore, were the election of Polk, the annexation of Texas, and the addition of a considerable area of new slave territory to the Union. Their last great effort made in the elections of 1846 was attended with no success. Their last national convention, held in Buffalo, Oct. 20, 1847, nominated John P. Hale and Leicester King for President and Vice President, but the movement towards amalgamation with the new Free-Soil party (q.v.) had already begun. The nominees withdrew after Van Buren's nomination, and, except for the continued activity of a small number who had adopted the view that slavery could be abolished under the Constitution by a simple act of Congress, the Liberty party ceased to exist.

Bibliography. The best account of the Liberty party is contained in T. C. Smith, *History of the Liberty and Free Soil Parties in the Northwest* (New York, 1897). Consult also, J. D. Hammond, *History of Political Parties in the State of New York* (Cooperstown, 1846); B. F. Morris, *Life of Thomas Morris* (Cincinnati, 1856); William Birney, *James G. Birney and his Times* (New York, 1890); A. B. Hart, *Salmon P. Chase* (Boston, 1899), in the "American Statesmen Series"; McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. ii (New York, 1914).

LIBERTY TREE. 1. An elm in Boston, upon which the citizens hung the effigies of the British stamp distributor and other unpopular persons during the excitement connected with the Stamp Act. The tree stood on Washington Street, and is recalled by an appropriate device on the building which occupies its site. 2. A Revolutionary War ballad by Thomas Paine (1775), published in the *Pennsylvania Magazine.*

LI′BER VER′ITA′TIS (Lat., Book of Truth). A series of original drawings made by Claude Lorrain (properly Gelée, q.v.) for the purpose of protection against the imitation of his paintings by others. The work, engraved by Richard Earlom, was published by John Boydell in 1707.

LIBIDIBI, lē′bē-dē′bē. A tropical tree whose pods are used in tanning. See Divi-Divi.

LIBIN, lē′bĭn, S., pseudonym of Israel Hurwitz (1871-). A popular Yiddish writer, born in a little Russian town (Gorki) in the Government of Mogilev. Intended for a rabbi, he received the traditional orthodox Jewish education. At 14, however, the boy set about acquiring a secular education by self-study. In 1891, after serving a trade apprenticeship, he left Russia for England and soon afterward came to the United States and settled in New York. Libin's literary career began in 1894 with a short sketch ("Spring") published in the *Arbeiter Zeitung*, a Jewish Socialist weekly. Numerous other sketches appeared from time to time, but it was not until his first successful play, *Broken Hearts*, was produced (1905) that he attracted general attention. Thereafter he was a constant contributor of short stories, plays, and novels to Jewish-American newspapers chiefly the *Vorwarts.* Of his shorter pieces five volumes have so far been published (*Collected Sketches*, 1902, 1907, 1910; *Selected Works*, 2 vols., 1915). His plays, on which his greatest popularity rests, numbered 35 in 1915. Among the better known are *The Belated Wedding* (1900), *The Jewish Medea* (1901), *Broken Hearts* (1905), *The Dreamer* (1909), *The Abyss* (1911), *A Mother's Revenge* (1913), *The Power of Passion* (1914). His several novels are artistically inferior to his best plays and sketches. A realist, like all his contemporaries among Yiddish writers, Libin draws his themes from the Ghetto. The finely contrasting humor and pathos of his best work have brought him recognition as one of the greatest Yiddish story-tellers of his day and as a playwright second only to Jacob Gordin (q.v.), by whom he, in common with all present-day Yiddish playwrights, has been influenced.

LIB′ITI′NA. An old Italian goddess of the dead, and of funerals, identified by the ancients both with Venus Lubentia (or Venus Lubentina or Venus Libitina) and with Proserpina. The identification with Proserpina was natural enough; that with Lubentia arose because both *Libitina* and *Lubentia* were connected by the Romans with *libido*, pleasure, voluptuousness, and from the fact that in the grove about the temple of Libitina was a shrine also of Venus. From her temple, situated, perhaps, on the Esquiline, all the necessary apparatus for funerals had to be bought, and a piece of money was deposited there for every person dying in Rome. Undertakers were called *libitinarii*, and the gate of the amphitheatre through which the dead were removed bore the name of Porta Libitinensis. Libitina sometimes in poetry stands for "death" or "the grave." Venus Lubentina was perhaps an Italian goddess of gardens. Consult Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

LIBMANÁN, lēb′mȧ-nän′. A town of Luzon, Philippines, in the Province of Ambos Camarines (Map: Philippine Islands, D 4). It lies near the mouth of the Polanluna river. It has a post office and a telegraph station. Pop., 1903, 17,416.

LIBOCAN, Hájek of. See Hájek of Libocan.

LI′BOCE′DRUS (Neo-Lat., from Gk. *λίβος*, *libos*, tears + *κέδρος*, *kedros*, cedar). A genus of evergreen trees, belonging to the Pinaceæ, resembling the arbor vitæ, but differing in the structure of the cones, the scales not overlapping as in that tree. There are two species in New Zealand, *Libocedrus bidwellii* and *Libocedrus doniana;* two in the mountains of Chile, *Libo-*

cedrus chilensis and *Libocedrus tetragona;* one in the Pacific Sierras of the United States, growing usually at an elevation above 4000 feet; one in China, *Libocedrus macrolepis;* and one in New Caledonia, *Libocedrus austro-calidonicus.* The Western United States species was named by Torrey *Libocedrus decurrens,* from the fact that the bases of the small scalelike leaves are decurrent upon the stem. The tree attains a height of from 120 to 140 feet, and a trunk from 6 to 8 feet in diameter, without branches for 80 to 100 feet. It is found from Oregon to Lower California. Its beautiful glossy green foliage and its graceful form when young make it one of the finest of ornamental evergreens. It has been confounded with the *Thuya gigantea,* but its decurrent leaves make an easy distinction. In California it is called white cedar. Its wood, of a yellowish color, surpasses redwood in durability, and is valuable for various purposes.

LIBOURNE, lē'bo͞orn'. The capital of an arrondissement in the Department of Gironde, France, at the confluence of the Isle with the Dordogne, 22 miles east-northeast of Bordeaux (Map: France, S., D 4). Its ancient features include the fourteenth-century clock tower, the fifteenth-century church of St. Jean Baptiste with a spire 232 feet high, and a sixteenth-century town hall. Its modern institutions comprise a communal college, a school of hydrography, a museum, a library, a botanical garden, and a theatre. The surrounding district abounds in vineyards. The chief manufactures of Libourne are liquors, sugar, woolen goods, machinery, cooperage, and printing; it carries on a considerable trade in local manufactures and agricultural products by the river, which is navigable for vessels of 14 feet. Pop., 1901, 19,175; 1911, 15,350.

LI'BRA (Lat., balance). The seventh sign of the zodiac, its conventional symbol being ♎. At the first point of Libra, or, as it is often called, the *autumnal equinox,* the ecliptic passes across the equator to the Southern Hemisphere. Libra is also the name of a constellation situated immediately south of the celestial equator and east of Virgo. Its chief object of interest is the globular cluster *Messier 5,* which is rich in variable stars.

LI'BRARIES. A term applied alike to buildings designed to contain books and to the books deposited in these buildings. In the present article it is used chiefly in the latter sense.

History, Ancient. Though there were libraries in ancient times in Egypt, no extensive remains of these collections have been found. From very early days Babylonia was the seat of a learned and literary people, and almost every important temple contained its library of clay tablets in cuneiform writing, carefully shelved in regular order. Such a library was found at Nippur, in 1901, in the great temple of Bel, which was destroyed in the Elamite invasion (c.1782 B.C.). It was from the treasures of such libraries that King Asurbanipal of Assyria, in the seventh century B.C., caused copies to be made for the great library, consisting probably of over 10,000 works, which he gathered in his palace at Nineveh. The tablets here found by Layard and his successors contain history, science, religion, grammars, and dictionaries in the original languages of Babylonia and in translation.

Among the Greeks private libraries doubtless existed during the fifth and fourth centuries B.C., and there may be some truth in the stories of the collection of books by the earlier tyrants, such as Pisistratus and Polycrates; but these were of moderate size, even the library of Aristotle probably containing only a few hundred rolls, and of their character and administration we know practically nothing. It is with the founding of the Alexandrian Library (q.v.) by the first of the Ptolemies that the history of the great Greek libraries begins. At the time of their greatest development the twin libraries at Alexandria probably contained between 600,000 and 700,000 volumes or rolls, all carefully arranged and catalogued. In the Civil War Julius Cæsar burned the shipping in the harbor, and in the conflagration thus started the larger library was destroyed. The library of Pergamum in Asia Minor, a formidable rival to that of Alexandria, was founded probably by Attalus I and was largely increased by the fostering care of his successors. It was ultimately removed to Alexandria, being sent by Antony as a gift to Cleopatra, with a view to replacing the books destroyed under Cæsar. At the time of this transference it contained, according to Plutarch, 200,000 volumes.

At Rome interest in literature developed slowly, and the first important libraries appear to have been those gained as the spoils of war; thus, we are told that the library of the kings of Macedon was brought to Rome by Æmilius Paulus (167 B.C.). In the first century B.C. there were some notable private collections, as that of the grammarian Tyrannion, estimated at 30,000 rolls, and the carefully selected and valuable collection of Atticus, the friend of Cicero. Cæsar is said to have planned a public library; and Pliny states that C. Asinius Pollio (39 B.C.) erected from the spoils of his Parthian victories the first public library in Rome, in the temple of Libertas; but according to Plutarch this honor should be given to Lucullus. Another public library was established by Augustus on the Palatine, in connection with his new temple of Apollo. This was divided into Greek and Latin sections. Another was placed by the same Emperor in the Portico of Octavia. Tiberius and later emperors continued the foundation and maintenance of public libraries. Especially famous was the Ulpian Library, established by Trajan, which soon surpassed all others in Rome and was later removed from the Forum of Trajan to the Baths of Diocletian. The number of public libraries in Rome is said to have reached 28 by the fourth century. Nearly 1700 manuscripts and fragments of manuscripts have been found in a library room at Herculaneum, about 400 of which have been more or less unrolled and deciphered. And in the Roman provincial towns throughout the Empire public and private libraries were numerous. In fact, the library facilities of the Roman world in Imperial times probably surpassed those of modern Europe before the middle of the eighteenth century.

In the ancient libraries the books, usually rolls of papyrus, were kept in closets, in somewhat small rooms, which, however, seem to have been arranged for the use of the books. Catalogues were prepared, and those of Alexandria were valuable sources for literary history. The librarian was commonly a distinguished scholar and in later times seems to have ranked as an important public officer. The first librarian of whom we have any record was a Babylonian named Amil-anu, who lived about 1600 B.C., one of whose signet cylinders is in the British Museum. Nehemiah is said to have founded a library, and references in the books of Samuel and Kings to other books imply some collection in which these works might be found.

As the Christian Church came to possess a distinct literature, not only were small collections established in the important churches, but libraries of some size devoted largely to Christian writings were founded. Eusebius mentions an early Christian library established by the martyr Alexander, Bishop of Jerusalem, who died 250 A.D. St. Pamphilus, another Christian martyr (309 A.D.), founded at Cæsarea a public library which grew to about 30,000 volumes, chiefly theological, and which is said to have been destroyed by the Arabs in the seventh century. St. Jerome had a large library and made frequent use of that at Cæsarea. St. Augustine, on his deathbed (430 A.D.), requested that the library of the church at Hippo and all his manuscripts should be carefully preserved. In the early monasteries of Tabenna, founded by Pachomius, in the depths of the Thebaid in Egypt, there was a library in every house, showing the early connection between monasticism and libraries.

Julian the Apostate (363 A.D.) founded libraries of a different character, upon which he inscribed the words: "Some love horses, some birds, others wild beasts, but from boyhood I have been possessed with the desire of acquiring and owning books." Constantine the Great founded (336 A.D.) a library at Constantinople, which at his death is said to have contained 6000 volumes; it grew under Julian and Theodosius the Younger to 120,000 volumes. In it was deposited the only authentic copy of the proceedings of the Council of Nice, and among its curiosities were a manuscript of Homer, 120 feet in length, written in letters of gold on serpents' skin, and a copy of the Four Gospels bound in plates of gold weighing 15 pounds and enriched with precious stones. This library was destroyed by fire under Zeno (477 A.D.). A later collection, extending to 33,000 volumes, is said to have been destroyed by Leo III "the Iconoclast" (730 A.D.). The triple fire at the capture of Constantinople by the Crusaders, in 1203, eclipsed all previous ones in destructiveness. Two hundred and fifty years later came the final disaster of the Ottoman conquest. Despite all these losses, possibly through some of them, the great libraries of Europe owe to Constantinople some of their choicest treasures.

History, Mediæval. Through the Middle Ages books and learning were chiefly preserved by the monasteries, especially those of the Benedictines, beginning at Monte Cassino (530 A.D.). Each Benedictine house instituted first a library, then the *scriptorium*, or writing room, where manuscripts were copied for its own use, for sale or exchange, and lastly the school, open to all who desired instruction. Many famous libraries of Europe had their nuclei in these Benedictine collections. Notable among these are the libraries of Monte Cassino, Bobbio, Fleury-on-the Loire (c.650), Corbie (662), Hersfeld, Ratisbon, Corvei (q.v.), Reichenau (724), Fulda (774), Saint-Gall (820), and Clugny (910). In addition to the Benedictines, the Augustinians and the Dominicans were distinguished for their care for libraries. Charlemagne established libraries in his cloister schools at Aix-la-Chapelle and Tours, to which Alcuin brought the training he had secured at St. Mary's in York, England.

England is indebted to the Benedictines for her earliest library, that of Christ Church, Canterbury (596), and for St. Peter's of York, St. Cuthbert's at Durham, and those at Peterborough, Wearmouth (647), Bury St. Edmunds, Reading, and St. Albans. The Franciscans had a considerable library at Oxford, to which Adam de Murisco left his books (1253). The Bodleian at Oxford was opened in 1602. The library of the University of Cambridge dates from 1475. On account of the scarcity and costliness of writing materials, and because of the prevailing ignorance and neglect of letters, none of these monastic libraries attained to any great size, 2000 volumes being about the largest number recorded. Nevertheless, the monastic libraries performed an incalculable service in the preservation of Latin and (in part) Greek literature.

History, Modern. In Germany, with the fourteenth century came the establishment of libraries in connection with the new universities, as those at Prague (1348), Heidelberg (1386), Leipzig (1409); and the first public town libraries, the outcome of humanism, at Ratisbon (1430), Vienna (1440, opened to the public in 1575), and Frankfort (1484). The zeal for letters which so marked the Renaissance led to the formation of great private collections which were frequently made the bases of public libraries as, e.g., the library presented to Durham College by Richard de Bury, and the great Medicean Library founded by Cosimo de' Medici at Florence. The suppression of the monasteries after the Reformation in Protestant countries gave an impulse to the foundation of the royal, ducal, and town libraries. Many important ones were established in the eighteenth and nineteenth centuries: Göttingen (1737), Bonn (1818). All the universities of Germany have large libraries, and in addition the royal libraries at Berlin, Vienna, Dresden, Munich, etc., are among the most notable collections in the world. No other country can show such well-equipped libraries for scientific research as those of Germany and Austria at the present day.

Spain, with its university at Palencia (1212), which removed to Salamanca in 1254, takes a very early place in library history. The National Library at Madrid is the largest in the country, having 700,000 volumes.

The famed Corvina, established by Matthias Corvinus, King of Hungary (c.1460), was probably the largest and finest collection of manuscripts ever made in Europe, reaching over 50,000 volumes, but its treasures were dispersed by the Turks in 1527; scattered specimens are to be found in more than 30 of the libraries of Europe. The Royal Library at Copenhagen, dating from 1479, the largest of Scandinavian libraries (over 800,000 volumes), is specially strong in Icelandic literature and has a fine collection of Persian manuscripts.

The first public library in Italy was founded at Florence, in 1437, on a bequest by Nicoli, the Florentine Socrates, of his own collection of 800 manuscripts. Cosimo de' Medici erected a building for it in 1441, and later, under his grandson, Lorenzo de' Medici, it acquired the name of Laurentian Library. With the expulsion of the Medici at the close of the fifteenth century the collection passed into the possession of a monastery. Later Leo X bought it, and in 1521 Cardinal Giulio de' Medici restored it to the city and housed it in a building erected by Michelangelo. This is one of the richest and most valuable libraries in the world, only surpassed (among Italian libraries) in manuscript treasures by the Vatican. Although the library of the popes can be traced back to a remote antiquity, it was Nicholas V who founded the present Vatican Library in 1447 and left it at his death enriched with 9000 manuscripts. In 1588 its present building was erected by Sixtus V. In addition to a long series of notable acquisitions of valuable manuscripts the famous Urbino Library was acquired for it in 1658. Queen Christina of Sweden enriched it with a splendid collection of manuscripts and books. In 1746 the Ottoboni collection of 3862 German and Latin manuscripts was added. During the nineteenth century the process of adding great collections had gone on, the most impressive purchase being that of the entire Barberini Library. There are over 31,000 Latin manuscripts, and the Greek and Oriental number over 4000 each. Moreover, there are upward of 400,000 printed books, many of the greatest rarity. Since the pontificate of Leo XIII the Vatican Library has been very freely open to scholars. Italy is exceedingly rich in libraries of historical interest; her university libraries contain many manuscripts and incunabula. Among the famous collections may be named the Ambrosian Library (q.v.), at Milan, founded in 1602; the Vittorio Emanuele, at Rome; the National Central, at Florence, formed by the union of the well-known Magliabechiana and Palatina; and the National of St. Mark at Venice. The university libraries are in the main admirable, and many of the smaller libraries contain manuscripts and books of great value. The archives of Venice, complete for more than 10 centuries and numbering 15,000,000 documents are housed under a single roof. Moreover, in Italy there is a strong and growing movement for the establishing of popular circulating libraries, somewhat on the model of the smaller public libraries in the United States.

France, in the Bibliothèque Nationale, at Paris, has the largest library in the world. Charles V in 1368 had a tower in the old Louvre fitted up as a library, where he gathered 910 volumes. These were scattered during the English wars, and many fell into the hands of the Duke of Bedford and were carried to London. Louis XI made an effort to revive the library. Henry IV gave it a home in the Collège de Clermont and appointed De Thou librarian. It narrowly escaped destruction at the time of the Revolution, when two of its librarians were guillotined. In 1666 it was removed to its present building, which has been frequently enlarged to accommodate the rapidly growing collection. The library now numbers well over 4,000,000 volumes of printed books, 500,000 maps, 110,000 manuscripts, and over 1,000,000 prints. The smaller libraries of Paris include the Arsenal, founded in 1755; the Mazarin (1643); and the St. Geneviève (1624), together with those of the university and other educational establishments. Large libraries owing their origin to monastic collections and to the liberality of private persons are to be found in all the provincial cities of France. Most noteworthy are those of Lyons (1527), Aix (1705), Rouen (1809), and Bordeaux (1738). There are (1915) over 13,000,000 books in French libraries outside of Paris, chiefly in the departmental and university libraries.

Great Britain possesses in the British Museum a library second only to the Bibliothèque Nationale of France in size and probably surpassing it in the value of its contents, amounting to over 5,000,000 items of all sorts. The library dates from 1753, when the collections of Sir Hans Sloane were acquired by the nation. Before it was opened to the public, in 1759, the Royal Library of the kings of England was given to it by George II, while the private collections of George III were presented in 1823. Under the able direction of Sir Anthony Panizzi the museum took first rank among the research libraries of the world—a rank it has maintained, its accessions having been distinguished fully as much by their character as by their size. The collections of manuscripts, maps, music, and prints are among the most valuable in the world. The catalogue of printed books (to 1899) is an invaluable work of bibliographical reference, supplemented by numerous special catalogues and indexes.

In London are likewise the Patent Office Library, the National Art Library (South Kensington), and a host of smaller libraries, while in the universities and in the great commercial centres are planted libraries of size and importance, among them the Bodleian at Oxford, the University Library at Cambridge, Trinity College Library at Dublin, the John Rylands Library at Manchester, the Mitchell Library at Glasgow, the Library of the Faculty of Advocates of Edinburgh, etc. There are also in Great Britain numerous most excellent public libraries alike in the large and the smaller cities, as well as certain vigorous proprietary or subscription libraries.

The earliest library in America was that presented to the Henrico College, established by the colonists of Virginia, in 1621, destroyed at the time of the massacre the next year.

Harvard University Library was founded in 1638. In 1700 came the Public Library in New York, changed in 1754 into the present Society Library. In 1700, also, South Carolina passed the Provincial Library Law to encourage parochial libraries. Yale College Library was founded in 1701. In 1731 Benjamin Franklin founded the Library Company of Philadelphia, which he called the "mother of all North American subscription libraries." In 1800 the Library of Congress (q.v.), called in its first general catalogue the Library of the United States, was established.

The first recognition of the principle of taxation for support of public libraries was the New York District Library Law of 1835. This was not for school but for public libraries, unwisely placed in charge of school officers as a mere convenience of administration. The general plan was copied in 23 other States and without exception has proved that, while undoubtedly schools and libraries should work in the greatest harmony, the best results demand that their administration be separated. Exceptions have been only numerous enough to prove the rule. These district libraries did a beneficent work, but under their own trustees, with proper supervision and well-organized administration, the same money might have done vastly more. But the law made the needed beginning in recognizing the popular educational character and possibilities of libraries. In 1849 New Hampshire passed a law allowing towns to tax themselves for libraries. In 1850 Great Britain passed the famous Ewart

Free Libraries Act. In 1852 the Boston Public Library was founded, and for a generation led the world in showing what might be done by a municipal library. In 1853 there was held the first library convention in New York City.

From these modest beginnings the libraries of the United States have grown to be certainly more numerous and probably more efficiently organized than those of any other country. In 1914 there were more than 2000 libraries of over 5000 volumes, the greater part being supported through taxation by towns and cities. Moreover, certain of them have attained a great size; among the largest being the Library of Congress (2,253,309 volumes), the New York Public Library (2,198,000 volumes), Harvard University Library (1,565,000 volumes), Yale University Library (c.1,000,000 volumes), Boston Public Library (1,067,000 volumes), Brooklyn Public Library (764,000 volumes).

There are more than 40 American libraries containing more than 200,000 volumes each. The striking feature of library development in the United States, shown in only a slightly lesser degree in Great Britain, is the great number of small city and town libraries. Few cities of any size, and none of any importance, are without one or more libraries. Many of these smaller public libraries are admirably managed and render a distinct public service. Libraries of the research type, on the other hand, are fewer than might reasonably be expected in so large and prosperous a nation. Almost all the States have general laws permitting localities to tax themselves up to a certain amount for library purposes.

Modern Movement in the United States. It was formerly the chief duty of the librarian to get and keep books. The library was a storehouse. But the modern library is less a reservoir than a fountain. Its librarian aims to be an active, aggressive factor in popular education. He recognizes fully his duty to get and to keep, but puts far above this his greater duty to make his books useful. The old library was of interest only to the learned few. The modern public library has won a place beside the public school as an instrument of education. In public interest and support, in liberality of laws and appropriations, in magnitude of individual gifts, the modern library movement in the United States, Canada, and Great Britain far surpasses any general interest in libraries of former days or of other regions.

The birth year of active, new work of the modern library movement was 1876. In it was founded the American Library Association, a most potent national body. The *Library Journal* was established as its official organ. The Library Bureau, a centre for library enterprises, started its work. In 1876 likewise the United States Bureau of Education published a volume of essays and statistics on libraries in the United States, to which Cutter's Rules for a dictionary catalogue was added as an appendix (latest ed., 1904). In 1886 the *Library Journal* was supplemented by *Library Notes*, later replaced by *Public Libraries*, published since 1896 by the Library Bureau at Chicago.

In 1893, at the Columbian Exposition, a national comparative library exhibit, under the direction of the American Library Association, prepared by the New York State Library, was a prominent feature in the United States Building. Similar exhibits were made at the Paris Exposition of 1900, the Pan-American of 1901 at Buffalo, and the St. Louis Exposition of 1904. The *A. L. A. Catalog* of 5000 of the best books for a town library was a leading feature of the Chicago exhibit, and a second edition revised and extended to 8000 titles was published by the Library of Congress in 1904 in connection with the St. Louis Exposition.

Significant of the new part public libraries are playing has been the action of Andrew Carnegie, who, in his avowed purpose of distributing his wealth for the greatest good of his fellows, has found nothing promising so large returns as coöperation with communities which are willing to pledge themselves permanently to devote, from public funds or other sources, for the annual maintenance of a public library, one-tenth the sum given by Mr. Carnegie for a building. From 1881 to Jan. 1, 1915, Mr. Carnegie has given to public and college libraries the total sum of $62,518,517.

The clearest testimony that this library movement is accepted as educational is found in the fact that circulating, subscription, and proprietary libraries have largely given way before the tax-supported free public library, just as the private and denominational schools have been so often replaced by the tax-supported free high school. All the important steps in the historic development of the public school system have been also experienced by public libraries; among which are educating public sentiment, making libraries entirely free, giving grants and subsidies from public money, a certain degree of supervision, published reports, professional journals, training schools and classes corresponding to normal schools and teachers' classes, institutes, inspectors; and, finally, State library commissions, which will probably grow to State departments. A further step is often advocated to complete the correspondence: i.e., requiring State certification of librarians as to fitness for their duties.

The conception of the library's scope and functions has broadened rapidly in recent years. Originally the library might be used by a privileged few. Then those who paid a fee might use it. Finally it was made free to all for reference. The thought of taking any book from the older libraries was as preposterous as that of borrowing specimens or pictures from a museum. Later the favored few might borrow, then all who paid a fee, and last came the broad plan of lending freely to all. Finally the library became aggressive and reached out to secure readers as vigorously as a merchant to secure patrons. In an earnest effort to bring books within the reach of every portion of the community branch libraries have been very widely established in the large cities. The express, mail, and telephone are now used to make books more accessible. One or more books were lent to readers at a distance; then home libraries were sent out to local centres for groups of a dozen children. Traveling libraries of 50 or 100 volumes were sent to every community wishing them. The idea spread rapidly, and the "traveling library," or small collection of books, now obtains in most States, usually under the direction of the State Library Commission. The need of reaching rural homes too scattered for the larger collections led New York, in 1903, to offer to send out the house library of 10 volumes. Book wagons and cars are now in use in certain localities. Perhaps the most significant features of late years in the internal management of libraries (so far as they affect the public) are the development of reference librarians to answer questions; of the children's room and librarians devoted wholly to the needs of little people; of free access to open shelves so that all readers may have the advantages of actually handling the books; provision for those who cannot come to the main library, by means of branches and traveling libraries; and the appraisement or evaluation of books by disinterested authorities, so that a reader may have a trustworthy guide in selecting from the millions of books in existence the one best adapted to his needs.

It is generally held that the library has three functions: (1) as a storehouse of books and knowledge; (2) as a laboratory for study and research; (3) as affording sane recreation. Every library performs some one of these functions; some few attempt all three. Every public library of any size must have a reference and a lending department and general reading rooms for periodicals. It should work in close touch with the schools, but under independent trustees. It is the natural home for local collections in science, art, or history; for lectures, meetings of clubs, and all interests outside the schools which help on education and culture. Many Sunday schools find it wiser to turn their books over to the public library, where Sunday-school teachers may meet during the week, with access to books, pictures, and all facilities for study. The library field is being rapidly enlarged in various directions, particularly in direct service to the local government and to local industries.

Modern legislation aims to make it easy to establish and difficult to abolish libraries, to encourage gifts, to grant State aid to communities willing to help themselves, to collect the results of experience in library management and make them available in print and, by personal expert advice, to protect library property by stringent laws.

Types of Libraries. Because of their number and importance, public libraries are always meant in this article unless some other type is specified. Private libraries do not fall within the scope of this discussion, nor do proprietary and club libraries, as they are in a sense only larger family libraries, open only to those elected to membership.

Subscription or circulating libraries are carried on as a business and are usually open to all who pay the fees. Circulating libraries charging a small daily or weekly fee have grown greatly in numbers in the United States of recent years and are not confined to books alone, some of them including music, phonograph records, etc., in their stock. Their records and methods are naturally the simplest and cheapest, except in the case of certain institutions like Mudie's and Smith's in England, which have no exact counterpart in America.

National and State libraries have a distinct function, in addition to their daily service to the State and to scholars, in preserving for posterity the literature of their particular region or country. They are the central storehouses on which all local libraries in their field may draw when necessary. This demands large provision for storage and facilities for sending books quickly and safely to students and libraries. They should have books, pamphlets, manuscripts, and other material which because of rarity, costliness, or slight demand are seldom found in local collections. The smaller libraries have learned that the first cost of a book is seldom its chief expense. It must be catalogued, classified, shelved, cleaned, and inventoried yearly, even if never used. Libraries limited in funds cannot therefore afford to accept as gifts collections of books seldom used. The traditional conception of a library required it to keep all it could get. The immense growth in volume of books issued has enforced new ideas and has relegated the duty of preserving printed material no longer of immediate use to the national and State libraries, together with a small group of large institutions. Thoughtful observers fully realize that even public libraries, except a few great central storehouses, must abandon the plan of keeping everything, selecting up to their capacity what will be most useful and sending the rest to State or national centres, to be destroyed if found to be duplicates too common to be worth keeping.

Special Libraries. Every department of human endeavor is using the library as its laboratory, with the result that special libraries are formed in great numbers for special work. This gives libraries not only for law, medicine, theology, education, art, history, but for other distinct departments, and particularly for the active use of great industrial and manufacturing establishments, insurance companies, and the legislatures of States and cities. These libraries on special subjects are frequently independent, but they are often treated as branches of the central collection and kept under supervision of its director. The growth of specialized libraries has led to the formation of a *Special Libraries Association*, and to the publication of a monthly journal entitled *Special Libraries* (Indianapolis, Ind.).

The value of good reading in giving to any class of people information that will help them to do their work better, or inspiration and recreation which will broaden and sweeten their lives, has led to forming general libraries for special classes wherever people can be interested and command leisure to read. Owners of factories, stores, mines, and other employers have found it profitable to furnish such libraries for recreative reading on the part of their employees. Governments put them in prisons, asylums, and other institutions. Cities send them to station and engine houses of police and fire departments.

University and College Libraries. In these circulation is subordinate to reference and research work, a most important feature being to teach students how to use books and to give opportunities to handle them with a freedom formerly thought impracticable in a public library, though recent experience with open shelves has shown that the public can be trusted far more than was supposed. In modern university work every department finds the library as necessary as its laboratory. In America the university libraries have come to form a most important group in both quality and size of their contents, Harvard, Yale, Columbia, Chicago, Cornell, and Pennsylvania being among the largest and richest libraries in the country. Many normal schools and colleges give systematic instruction to their students in using books and in the mechanism of the library—not to train them as librarians, but to give them the ability to get the most from books and modern libraries.

Building. The location in cities should be very near the business centre, but preferably on a side street just away from the noise of the main thoroughfare. In larger towns branches and delivery stations of the public library should bring library facilities within easy walking distance of every home. For small public libraries the heavy cost of fireproofing is needless, as most of their books can be readily replaced, and a vault or safe will hold their rarities.

There is no accepted type of library building. For branches in cities and for the libraries of small towns there has been developed a type of structure with reading rooms on either side of the entrance, loan desk opposite the door, and stacks in the rear, which has found common acceptance. Circular, spiral, and other peculiar buildings have won no general approval, except that many recent buildings show a round end with radial stacks in view of the delivery desk.

The best library buildings in America are naturally recent. Of the large libraries, the Newberry Library of Chicago (1893), Boston Public Library (1895), Library of Congress and Chicago Public Library (1897), Providence Public Library (1900), Wisconsin Historical Society and Newark Public Library (1901), District of Columbia Public Library (1902), St. Louis Public Library (1910), New York Public Library (1911), are the most conspicuous for size, cost, and distinctive plans. Among the university libraries the buildings of Columbia, Cornell, New York, Princeton, California, Chicago, and Harvard deserve mention. It is now possible to secure expert advice in planning library structures alike for small and large institutions. State library commissions are always prepared to give this aid, particularly to trustees of small libraries. For large undertakings it is customary to hold a competition to secure a design and an architect. Trustees generally stipulate that they shall be free to use any suggestions in any competitive plan by paying for them, instead of being compelled to choose some one plan as a whole. The consensus of professional opinion may be summed up in the following brief general rules: Plan each library specially for its work and community; care for interiors before exteriors; provide amply for future growth; plan for economy in administration by arranging rooms to allow supervision by the smallest possible staff; sacrifice no convenience for architectural effect. Certain rooms must be near the card catalogue; and the catalogue must be close to reference room, loan desk, and cataloguers. The plan should aim to give direct access to each department without passing through other rooms. The general effect should be cheerful and hospitable. Permanent partitions should be omitted except where necessary for support; and temporary partitions, which can be readily moved as growth and changes demand, are better.

The smallest library occupies one room. As the library grows, its next need is a quiet study room, free from the noise of issue and return of books and current work. The third room needed is usually one for children, which, if possible, should have an independent entrance, so that they will not pass through the doors or corridors used by adults. In more complex structures on the main floor there must be delivery and book rooms for quick service, children's room (unless in the basement), and, if space allows, rooms for librarian, cataloguers, and for reference. Above or below may well go class, trustee, lecture, and other rooms used by fewer people or less often, both rooms and books most used being nearest the entrance. Basement and attic should both be planned so that they can be finished for public use, for the rapid growth of libraries has shown that all available space will surely be needed. The height of book rooms and of the stories of the building should be regulated by that of the book stacks; 7½ feet ordinarily is the unit. In no case should the floors of the stacks fail to register with those of the building. The most common error is in building on too small a lot, as ample space is needed for light and quiet and for inevitable growth.

Book Shelves. The rapid growth of libraries is a constant embarrassment. The most compact possible system of storage is still costly. Small libraries usually house their books on wooden shelves adapted to the dimensions of their rooms. Larger libraries must use a stack, i.e., shelving set close together and yet allowing ready access by aisles. Stacks are of iron or steel uprights with wood or steel shelves, and from 1 to 10 stories or decks high, each deck carrying the weight of all above it, aisles always being exactly over aisles. In computing capacity of shelving, 10 volumes to the running foot are allowed for public libraries, with shelves crowded. Economy requires ample vacant spaces to insert additions, so that shelving must always exceed the calculated capacity. Wall spaces of stack rooms should not be divided into aliquot parts, but into standard shelf lengths. The ordinary standard wooden case is eight shelves (7 feet, 8 inches) high and five tiers (13 feet, 6 inches) long, and uprights 2 inches thick. On its two sides the 10 tiers of 80 shelves hold 2000 volumes in close packing. For a one or two deck stack wood is cheapest. Steel is necessary to carry the load of taller stacks. Where the public has access to the shelves a wide aisle is very desirable. Doors are now never used on library shelves except for rarities. Tall ladders have given way to galleries, 30 to 40 inches wide, as quicker and safer. All books should be within the natural reach of a person 5 feet high. The front edges of shelves and uprights may be rounded to save wear on bindings.

When old buildings are adapted for libraries, extra floor supports must be put under book stacks to carry the great weight. It is wiser, however, to build a wing for a stack with the weight directly on the ground, or on concrete piers.

Reading Rooms. Three types are: (1) the quiet study or reference rooms for research work and study; (2) periodical rooms, which usually suffer from rustling newspapers and noise of constant coming and going; (3) children's rooms. Entrances to periodical and children's rooms should be as near the street as practicable, for convenience and to keep noise away from quiet rooms. Larger libraries need separate reading rooms for art, patents, music, bound newspapers, and other large special collections. Small study rooms are most costly to build and to supervise and so are in little favor. Economy requires for general purposes a large central hall, so that reference books and attendants need not be duplicated.

Special Rooms. Even small libraries need coat and toilet rooms near the entrance. There should be at least one room in which conversation is allowed. The library is a kind of intellectual clubhouse; and those who wish to play chess or other quiet games, discuss books, look at pictures, hold meetings of study clubs or classes, should have a place, as well as the reader demanding quiet. A separate trustees' room is usually wasteful of space, and if built should serve for some use not interfering with the infrequent trustees' meetings. A catalogue and work room is needed for all but small libraries. As work grows, various administrative rooms are demanded.

Light. Good daylight in all parts of the building has become less essential since electricity is so widely used. Windows, preferably on the north or east side, where they avoid direct sunlight, should reach to the ceilings and have square tops, since light area there is worth double that near the floor. In stacks windows exactly opposite centres of aisles are best. Walls should be tinted with colors that reflect instead of absorb light. Bright general illumination with artificial light is usually unnecessary and unsatisfactory in study rooms. A reading lamp on each table, the wire coming from below, is practically essential. Even the best lights on ceilings or distant from tables are injurious to sensitive eyes, if exposed. If general lights are used, they should be so arranged that direct rays do not reach the eye. Proper heat and ventilation are specially important in all portions of a library building.

LIBRARY ADMINISTRATION

The work of the larger public libraries falls naturally into the following departments:

General Administration. The librarian (or director), assistant librarian, secretary, and disbursing officer, with their necessary office forces, are usually met with (under varying names) in libraries of any size. The needs of large city systems call also for some official in charge of the numerous branch libraries. In addition there are the heads of the various departments described below. Most libraries have a classified system for the subordinate service with definite grades and provision for gradual advancement in salary. Seven hours daily is the limit of good work in cataloguing and similar steady, exact work. Eight hours are usually required of attendants whose duties are less exacting. Libraries which have studied results most closely give a full month's vacation with pay, and some allow one additional month during the year for total absence from illness or other causes. Salaries are steadily working upward, with the demand for higher qualifications and fuller professional training. Small rural libraries may be kept open a few hours a week for \$100 to \$300 a year. The great libraries now pay \$5000 or more to their directors. The tendency is to open libraries on holidays, Sunday afternoons, and evenings. Where practicable, hours are generally from 9 A.M. to 10 P.M.

Order Department. This includes the whole work of selecting and getting books and other material, and of handling gifts, the sale or exchange of duplicates, and keeping the accession record. For cataloguing department, see CATALOGUING; for classification, see below.

Reference Department. Systematic aid to readers is given in the smaller libraries by means of an assistant stationed at the information desk or by the reference librarian. In larger libraries the demand has led to adding various assistants who devote their time to answering questions, helping readers to find what they wish, and aiding in the use of bibliographies and catalogues. Larger institutions are developing a library faculty of specialists, each assisting readers in his special field.

The rapid development of reference work is a special feature of recent years in American libraries. The books of the reference librarian are the best reference books, supplemented by card indexes, notes, and all bibliographic devices. The reference department is called on to aid in answering questions on every conceivable subject and aims to teach applicants how to make investigations for themselves and thus in time develop the ability to use to the best advantage a well-equipped library. This department in effect may become the information bureau for its whole constituency. Some investigations, however, require considerable time and are not in their nature of such public value as to be justifiable at public expense. In some libraries these are made for any one willing to pay the pro rata cost of an assistant's time. This gives free use of all library resources and facilities and protects against using the time of public officers for private purposes.

Free access to the shelves is becoming more common, and in most libraries serious students have no difficulty in getting shelf privileges.

Loan Department. This has charge of the registration of borrowers and the issue and return of books. Many libraries allow two or more books (not fiction) to be lent. Books may usually be reserved, and notice is freely sent when books asked for are ready. Interlibrary loans are common, particularly of rare or costly books and manuscripts. A lending library has ceased to be a mere storehouse of books for circulation, but aims to induce its readers to borrow better books by restricting the supply of the less desirable and by inciting interest in the best through annotated lists in newspapers and on slips for free distribution, by illustrated bulletins, by personal suggestions, and by shelves open freely for all to browse among tempting books. Notable gains have resulted from these systematic, intelligent, sympathetic efforts to improve the average of books lent.

Shelf Department. This has entire charge of arrangement and preservation of books and all other material. It must keep all the library collections in order and clean, and find or replace missing books. A complete inventory is taken once a year, but well-managed libraries no longer close for this purpose, but distribute the work of stock taking and cleaning throughout the year. The inventory is taken by means of a shelf list. This has class, book, volume, and accession numbers, author, and brief title of every book, written on loose sheets laced together in a binder, or on cards arranged in the order in which the books stand on the shelves. It forms a brief and very convenient subject catalogue. In the relative system, now almost universally preferred, shelves require no numbers, the class numbers of the books being the sole guide. If shelves are numbered, the plan should be so comprehensive that numbers signify position as well as sequence.

Library Classification. A collection of books must be classified before it deserves the name "library." Classification is putting like things together. Each book, pamphlet, clipping, map, or other item goes with any others like it on a carefully systematized plan, so that matter most closely allied and oftenest used with it will precede or follow closely. Only thus can all reasonable demands of readers be met fully and promptly. The vital importance of classification has long been recognized. Systems of book arrangement have appeared in large numbers, while almost every library formerly followed some scheme of its own, largely governed by local and individual circumstances. It is, however, an almost endless work to prepare a complete scheme, and when done it never wholly suits the maker, much less any one else. To avoid the inevitable delays and confusion of elaborate systems, some libraries were arranged in order of acquisition, some by authors like a directory. Usually there was broad classification by subjects, and librarians and readers did the best they could by aid of bibliographies, subject catalogues, and indexes. Some systems of classification had no indexes. The book number itself in the older American and foreign libraries generally indicated a fixed location on a particular shelf, which had to be altered as often as growth made it necessary to move the books on that subject.

The great desideratum was a system that would do away with the expensive necessity of renumbering books as soon as the growth of the library made it necessary to shift the books. This was provided in 1876 by the publication of the *Decimal Classification and Relative Index*, by Melvil Dewey, which showed by the same number both subject and location. This scheme divides the field of knowledge into nine main classes, numbered 1 to 9. Encyclopædias, periodicals, etc., so general in character as to belong to no one of these classes, are marked 0 and form a tenth class. Each class is similarly separated into nine divisions, general works belonging to no division having zero in place of the division number. Divisions are similarly divided into nine sections, and the process is repeated as often as necessary, the full tables covering some 20,000 topics.

Books on the shelves and cards in the classed catalogue are arranged in simple numerical order, all class numbers being decimal. Since each subject has a definite number, it follows that all books on any subject must stand together under that number. The tables show the order in which subjects follow one another, 512 algebra preceding 513 geometry, and following 511 arithmetic. Of this E. C. Richardson says in his *Classification, Theoretical and Practical* (pp. 199–200), published by Scribners in 1901:

"This system has probably had more vogue than any other bibliographic system ever published save possibly that of Brunet. Taken as a whole and regarding the substantially unchanging form and notation, among the multitude of derived systems with minor variations, it is undoubtedly true that no system ever invented has been applied to as many libraries (probably at the present day several thousand) as this. . . . It is now being adopted very generally on the continent of Europe by booksellers even as well as libraries, and is of late, through its adoption by the Brussels Institute (for international bibliographic work), having a very zealous propaganda by its converts, especially in France and Italy. . . . The reasons for its deserved popularity are to be found: (1) in an intelligent and consistent application of the decimal notation (not new with Dewey, but first by him vigorously and consistently applied); (2) in the grasp of mnemonic possibilities of this situation; (3) in the practical, intelligent, and often up-to-date management of the remoter subdivisions of the, in some places, somewhat artificial, larger subclasses; (4) in the fully printed schedules with their 'relative index,' which more than anything else is the cause of the practicality of this system and its wide adoption. In other words, its popularity has been due to intelligent practical usefulness." The *Decimal Classification* is now adopted by the great majority of public libraries in America and by very many in Great Britain, where, however, it has a serious rival in the *Subject Classification* of J. D. Brown.

The distinguishing features of the decimal classification are:

Relative Index. The card catalogue is rapidly displacing the book form. It could not be indexed like a book by reference to pages, for cards to which additions are made daily could not be numbered like pages. The solution for classed catalogues was to number subjects so that the entry in the relative index was followed by a number which meant not a page of a special book, but a subject in the complete scheme; e.g., geometry in the index is marked 513, meaning Class 5 Natural Science, Division 1 Pure Mathematics, Section 3 Geometry. This relative index number is therefore a key to card catalogue, shelves, pamphlet collections, shelf list, charging system, newspaper clippings, manuscript notes, in fact to everything arranged on the relative system. This feature the decimal classification shares with most modern systems.

Close Classing. All recent experience strongly confirms the wisdom of fairly close classification on shelves, and the practice has so changed that what 30 years ago was called extremely close classification would now be considered medium or even broad. Where libraries depend on catalogues and indexes alone for the resources on any subject, the practice usually results, after a few years, in doing the work over at greatly increased cost. The best results can be obtained only by having as far as physically practicable material on each definite subject standing together.

Simple Notation. In any plan the system of numbers to be placed on the books and cards is of the utmost practical importance. Extreme simplicity is necessary for rapid and accurate use by readers and attendants. Only Arabic numerals and Roman letters are sufficiently simple and familiar to be available for this purpose. Many libraries use nothing but figures to number subjects. The *Expansive Classification* devised and published by C. A. Cutter combines letters and figures, as does the system of the Library of Congress, which is followed by an increasing number of American libraries of the research type. The 26 letters allow 676 combinations with two characters or 17,576 with three, and as compared with Arabic numerals have 18, 46, and 118 times the capacity for three, four, and five characters. This is a great advantage, but produces numbers complicated in appearance. Both expansive and decimal systems, and various other modern schemes of book arrangement, meet the test of a good classification in insuring that books on the same subject shall be classed together and readily found when wanted.

Book Numbers. Mr. Cutter is also author of an ingenious and widely used table to keep books in each class in any system in alphabetical order. The author's initial is followed by a number which is the translation into figures of the rest of the name, so that the system is much simpler in handling and recording than it would be if the author's whole name had to be used. For scientific and other books where chronologic order is preferable, W. S. Biscoe, of New York State Library, devised a translation scheme by which a letter followed by simple Arabic numerals indicates date. Under the subject or class numbers most libraries use Cutter numbers, while many use also Biscoe numbers for science and useful arts.

Mnemonics. Both decimal, subject, and expansive systems make large use of practical mnemonics. These are of much use, especially in geographic divisions, languages, and form distinctions; e.g., since in the decimal classification German is invariably 3 and grammars 5, one knows without reference to tables or index that in class 4 philology German grammars must be 435. Library attendants are greatly aided by these mnemonic features and can often construct a number instantly. The principle also allows very minute subdivisions of topics where it is needed, as in limited divisions of historical periods.

Dictionary Catalogue. The relative index and relative location and closer classification than was thought possible before their invention are now generally accepted. But as arranging a card catalogue by the numbers of the relative index involves the constant use of a printed index or key to subject numbers, and requires a separate card catalogue of authors and titles, most libraries, using the relative location system for classification on the shelves, write specific subject cards and arrange them in the same alphabet with author and title cards in what is called a Dictionary Catalogue. See CATALOGUING.

LIBRARY SCHOOLS AND TRAINING

When near the close of the past century librarianship was very generally recognized as a profession, it was clear that it had the same need for professional schools as law, medicine, or teaching, but nowhere was there offered systematic training for this important field. Young college graduates of unusual promise were ready to enter the new profession, but no adequate facilities for training were offered. Columbia University established the first library school, which was opened Jan. 5, 1887. The three months' course was by petition lengthened to four and then to seven months, and then at once to two years, thus proving a demand for technical training not only larger than estimated, but also for broader and more thorough work than that originally planned. On April 1, 1889, by agreement between Columbia and the State, the school was transferred to the State Library at Albany. Library schools were opened in 1890 by Pratt Institute, Brooklyn, in 1892 by Drexel Institute, Philadelphia, in 1893 by Armour Institute, Chicago, later transferred to the University of Illinois. In 1915 there were 14 schools for training librarians in the United States, six of which require the equivalent of a college degree for entrance. The degree of bachelor of library science is given at three of these schools. Like law and medical schools, a library school offers only a technical course, making no attempt to give general culture. It usually gives only an outline treatment of historical and antiquarian topics, devoting its time to preparing its students for technical service in their chosen field. The course includes bibliography, cataloguing, classification, work of accession, loan and shelf departments, bookbinding, library buildings, administrative, supervisory, and State commission work, selection of books, general library methods and appliances. As practical training is the chief end, seminars, problems, study of libraries in operation, and other features are used in such proportion as experience has shown to give the best results. Practice work in all the different departments under careful supervision is an important factor.

Many large libraries have apprentice classes. Younger staff members and sometimes applicants for positions are organized in a class, assigned a teacher, and trained for several months in order to make them more efficient. Such classes are not open to the public and do not pretend to be library schools; but in a large library systematic class instruction is much cheaper and more effective than individual explanations by older assistants. Many colleges and normal schools give library and bibliographic courses, not to train librarians, but to teach their students how to utilize a large library, how to care for their own private libraries, and to give them a knowledge and interest that will qualify them to serve intelligently as library trustees.

Another form of instruction is for library organizers, members of commissions, or missionary librarians to meet for a day librarians needing assistance and answer questions and make suggestions. The name "institute" has been used for such "round table" work, but should properly be limited to work corresponding closely to ordinary teachers' institutes where most of the week is given to systematic short courses under expert conductors.

Library Associations and Clubs. The first convention of librarians in America was held in New York, Sept. 15–17, 1853, with 53 delegates. The next was held in Philadelphia, Oct. 4–6, 1876, with 103 delegates. At the close the American Library Association, whose object is "to promote the welfare of libraries in America," began its work, which has grown steadily in scope and usefulness. Its annual meetings alternate between East and West, from Boston to San Francisco and from Montreal to New Orleans. Its largest attendance is over 1200. It has sections devoted to special interests, e.g., college, reference, State library, trustees, library commissions, cataloguing, children's libraries, public documents, etc. Its most important branch is the American Library Association Publishing Board, consisting of five members who have charge of preparing and publishing bibliographies and other specially needed library aids. Funds for this board were raised by small subscriptions till in 1902 Andrew Carnegie made a gift of $100,000 for endowment. The board publishes various indexes and other helps to librarians, and certain annotated lists of the best books, for which George Iles has furnished the chief inspiration and most of the funds. The association maintains permanent headquarters with a paid staff in Chicago. Through it the experience of the library profession on many matters is focalized, formulated, and made available to all. At the close of the first international conference of librarians, held in London, Oct. 2–5, 1877, at which 22 Americans were

LIBRARY STATISTICS *

NO.	Library	City	Country or State	No. of vols.
1	Bibliothèque Nationale	Paris	France	4,050,000
2	British Museum	London	England	3,000,000
3	Library of Congress	Washington	United States	† 2,253,309
4	Public Library	New York City	New York	2,198,000
5	Imper. Publ. Biblioteka	Petrograd	Russia	2,043,822
6	Harvard University Library	Cambridge	Massachusetts	1,565,000
7	Königliche Bibliothek	Berlin	Prussia	1,450,000
8	Königliche Hof- und Staatsbibliothek	Munich	Bavaria	1,170,000
9	Public Library	Boston	Massachusetts	1,067,000
10	Kaiserl. Universitäts- u. Landes-Bibliothek	Strassburg	Alsace	1,023,133
11	Yale University Library	New Haven	Connecticut	1,000,000
12	Pub. i Rumyantzovski Musei	Moscow	Russia	1,000,000
13	Kaiserl.- und Königl. Hofbibliothek	Vienna	Austria	1,000,000
14	Kaiserl.- und-Königl. Universitäts-Bibliothek	Vienna	Austria	883,394
15	Cambridge University Library	Cambridge	England	860,000
16	Bodleian Library	Oxford	England	800,000
17	Kongelige Bibliothek	Copenhagen	Denmark	800,000
18	Public Library	Brooklyn	New York	764,000
19	Biblioteca Nacional	Madrid	Spain	756,000
20	Bibliothèque Royale	Brussels	Belgium	700,000
21	Königl. Universitäts-Bibliothek	Munich	Bavaria	690,000
22	Bibliothèque de l'Institut de France	Paris	France	650,000
23	Advocates Library	Edinburgh	Scotland	632,000
24	Bibliothèque de l'Arsenal	Paris	France	624,904
25	Königl. Landesbibliothek	Stuttgart	Würtemberg	603,186
26	Universiteits-Bibliotheek	Amsterdam	Holland	600,000
27	Koninklijke Bibliotheek	The Hague	Holland	600,000
28	Bibliothèque de l'Université	Paris	France	600,000
29	Königl. Universitäts-Bibliothek	Göttingen	Prussia	595,867
30	Reg. Biblioteca Nazionale Centrale	Florence	Italy	595,592
31	Imper. Varsavski Universitet	Warsaw	Russia	576,387
32	Universitäts-Bibliothek	Leipzig	Saxony	570,000
33	Königl. Öffentliche Bibliothek	Dresden	Saxony	570,000
34	Grossherzoge Hof-Bibliothek	Darmstadt	Hesse	568,850
35	Königl. Universitäts-Bibliothek	Tübingen	Würtemberg	555,283
36	Public Library	Chicago	Illinois	549,577
37	Public Library	Cincinnati	Ohio	537,820
38	University of Chicago Library	Chicago	Illinois	532,503
39	Columbia University Library	New York	New York	520,000
40	Public Library	Cleveland	Ohio	511,067
41	Imperial Cabinet Library	Tokyo	Japan	507,513
42	Grossherzogl. Universitäts-Bibliothek	Heidelberg	Baden	500,000
43	Imper. Vladimа Universitet. Biblioteka	Kief	Russia	500,000
44	Imper. Akademija Nauk	Petrograd	Russia	500,000
45	Universitets-Bibliothek	Christiania	Norway	495,000
46	Kiralyi Magyar Tudomány-Egyetem	Budapest	Hungary	491,831
47	Imperial University Library	Tokyo	Japan	491,082
48	State Historical Society (and Univ.) Library	Madison	Wisconsin	477,000
49	Biblioteca Nazionale Marciana	Venice	Italy	462,819
50	Imper. Universitet, Biblioteka	Petrograd	Russia	453,772
51	Bibliothèque de l'Université	Ghent	Belgium	450,000
52	Bibliothèque de la Ville	Lyons	France	450,000
53	Biblioteca Nazionale Centr. Vittorio Emanuele	Rome	Italy	450,000
54	Free Libraries	Birmingham	England	445,675
55	Free Library	Philadelphia	Pennsylvania	443,120
56	Public Free Libraries	Manchester	England	434,485
57	Corporation Libraries	Glasgow	Scotland	430,000
58	Universytet Jagiellónski Bibliotek	Cracow	Austria	429,154
59	Stadtbibliothek	Hamburg	Germany	425,756
60	Cornell University Library	Ithaca	New York	423,570
61	Königl. und- Universitäts-Bibliothek	Breslau	Prussia	416,870
62	Kaiserl. Königl. Universitäts-Bibliothek	Prague	Bohemia	415,948
63	Bibliothèque de l'Université	Lille	France	407,000
64	Bibliothèque Universitaire	Liége	Belgium	405,000
65	Carnegie Library	Pittsburgh	Pennsylvania	400,112
66	Magyar Nemzeti Múzeum	Budapest	Hungary	400,000
67	Universitetsbibliotheket	Copenhagen	Denmark	400,000
68	Gabinetto Scientifico-Letterario	Florence	Italy	400,000
69	Bibliothèque de la Ville	Grenoble	France	400,000
70	Rijks-Universiteit. Bibliotheek	Leyden	Holland	400,000
71	Bibliotheca Nacional	Lisbon	Portugal	400,000
72	Library of Parliament	Ottawa	Canada	400,000
73	Bibliothèque Ste. Geneviève	Paris	France	400,000
74	Biblioteca Apostolica Vaticana	Rome	Italy	400,000
75	Kungl. Biblioteket	Stockholm	Sweden	400,000
76	Universitets-Biblioteket	Upsala	Sweden	400,000
77	Rijks Universiteit-Bibliotheek	Utrecht	Holland	397,000
78	Regia Biblioteca Nazionale	Naples	Italy	395,439
79	Imper. Mosk. Universitet Biblioteka	Moscow	Russia	391,845
80	Königl. Universitäts-Bibliothek	Wurzburg	Bavaria	390,000
81	Königl. Universitäts-Bibliothek	Bonn	Prussia	385,750
82	Public Library	St. Louis	Missouri	374,997
83	University of Pennsylvania Library	Philadelphia	Pennsylvania	370,657
84	Stadtbibliothek	Frankfort a. M	Prussia	365,529
85	Reg. Biblioteca Universitaria	Naples	Italy	353,620
86	Newberry Library	Chicago	Illinois	352,044
87	Königl. Öffentliche Bibliothek	Bamberg	Bavaria	350,000
88	Biblioteca Nazionale	Turin	Italy	350,000
89	Trinity College Library	Dublin	Ireland	338,884
90	Public Libraries	Liverpool	England	338,450
91	New York State Library	Albany	New York	335,000

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* Number of volumes taken from *The American Library Annual*, 1913-14 (New York, 1914), checked with *Minerva*, 1913-14 (Strassburg, 1914). † 1914.

NO.	Library	City	Country or State	No. of vols.
92	Bibliotheca Nacional	Rio de Janeiro	Brazil	330,000
93	John Crerar Library	Chicago	Illinois	322,049
94	University of Michigan Library	Ann Arbor	Michigan	322,040
95	Grosvenor Gallery Library	London	England	320,000
96	Herzogl. Bibliothek	Wolfenbüttel	Brunswick	320,000
97	Königl.- und-Universitäts-Bibliothek	Königsberg	Prussia	318,000
98	Public Library	Buffalo	New York	316,908
99	Ἐθνικὴ Βιβλιοθήκη τῆς Ἑλλάδος	Athens	Greece	314,000
100	Reg. Biblioteca Palatina	Parma	Italy	313,323
101	Central Public Free Library	Leeds	England	313,196
102	Imper. Universitet. Biblioteka	Kazan	Russia	309,936
103	Princeton University Library	Princeton	New Jersey	309,268
104	Universitäts-Bibliothek	Kiel	Prussia	309,118
105	Enoch Pratt Free Library	Baltimore	Maryland	307,540
106	Öffentliche Bibliothek	Basel	Switzerland	300,000
107	Universitäts-Bibliothek	Freiburg-im-Breisgau	Baden	300,000
108	Bibliothèque Cantonale	Lausanne	Switzerland	300,000
109	Imper. Rossyski Istoričeski Muzei	Moscow	Russia	300,000
110	Grossherzogl. Bibliothek	Weimar	Saxe-Weimar	300,000
111	Public Library	Detroit	Michigan	299,384
112	Imperial University Library	Kioto	Japan	296,371
113	Imperial Library (Uyeno Park)	Tokyo	Japan	294,972
114	Universitäts-Bibliothek	Rostock	Mecklenburg	294,000
115	Universitäts-Bibliothek	Jena	Saxe-Weimar	289,338
116	Public Library	Melbourne	Victoria	286,940
117	Imper. Novorossijski Universitet	Odessa	Russia	280,144
118	Duchovnaja Akademija, Biblioteka	Moscow	Russia	280,000
119	Bibliothèque du Conservatoire Nat. de Musique	Paris	France	280,000
120	Bibliothèque de la Sorbonne, Ecole Normale Sup.	Paris	France	280,000
121	Universitäts-Bibliothek	Halle a. d. S.	Prussia	278,000
122	University Library	Edinburgh	Scotland	275,000
123	Public Library	Milwaukee	Wisconsin	273,444
124	Public Library	Minneapolis	Minnesota	271,689
125	Kaiserl.-Königl. Universitäts-Bibliothek	Graz	Austria	270,995
126	Universitäts-Bibliothek	Marburg	Prussia	270,000
127	Königl. Ungar. Universitäts-Bibliothek	Klausenburg	Hungary	269,689
128	Bibliotecas de la Universidad Central	Madrid	Spain	267,000
129	Universitäts-Bibliothek	Innsbruck	Austria	266,812
130	Verein. Universitäts- und Von Senckenbergische Bibliothek	Giessen	Hesse	261,747
131	University of California Library	Berkeley	California	260,000
132	London Library	London	England	260,000
133	Biblioteca Nazionale Braidense	Milan	Italy	259,680
134	Public Library of New South Wales	Sydney	New South Wales	258,742
135	Stadt-Bibliothek	Zürich	Switzerland	257,599
136	Boston Athenæum Library	Boston	Massachusetts	257,128
137	Biblioteca Universitaria	Bologna	Italy	255,000
138	Universitäts-Bibliothek	Erlangen	Bavaria	254,083
139	University of Illinois Library	Urbana	Illinois	251,000
140	Imper. Universitet, Biblioteka	Charkof	Russia	250,278

present, the Library Association of the United Kingdom, later chartered as the Library Association, began its work. It holds annual meetings at central points in the three kingdoms, and its council holds monthly meetings in London. It gives much more attention to the antiquarian and historical side of library work than the American Association, whose activities have been almost wholly directed to establishing new libraries, improving methods, reducing cost, and other directly practical ends. The National Library Association of Australasia was founded in 1896, in 1900 the Verein Deutscher Bibliothekäre was founded in Germany, and in 1901 the Kansai Bunko Kyōkai or Western Library Association was established in Japan with *Tōheki* as its official organ. In half a dozen other countries, notably Italy, France, and Denmark, growing interest in the modern library movement has been followed by organization. The first State Library Association was organized in New York in 1890, followed rapidly by other States, till now nearly all have such organizations.

In 1885 the New York Library Club, the first local body devoted to library interests, was started. Chicago followed in 1891, and now local clubs are found in most of the large cities and are being established also for groups of counties where the need is felt for more frequent meetings and closer contact than is provided by the State associations.

State Supervision, Grants, and Subsidies. Most of the States have now appointed library commissions, usually of three or five persons serving without salary, but often with a paid secretary or organizer. These commissions have charge of the State's public library interests. The commissions answer questions, help in selecting books, give suggestions and advise as to buildings, methods, and rules, and in several States make grants of books or money to new libraries. New York first of any State or country organized a distinct library department, under the Law of May 1, 1891. It grants for buying approved books as much as is raised from local sources, up to $200 annually. The law also allows grants from local money up to 10 cents for each volume circulated, but only under strict supervision. All books bought with State money must be approved by the Public Libraries Division of the State Library, and the recorded circulation on which subsidies from local funds are granted must be certified as conforming to a proper standard. As yet this plan of subvention by the State has had but few followers in other States. For law libraries in the United States see LEGAL EDUCATION.

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LIBRARIUS (Lat., *liber*, book). The ancient Roman name for a copyist or maker of books. See BOOK.

LIBRARY BUILDINGS. See LIBRARIES, *Building*.

LIBRARY OF CONGRESS, THE (the National Library of the United States). A public institution at Washington, D. C. It was established in 1800, destroyed in 1814 by the burning of the Capitol, afterward replenished by the purchase by Congress of the library of ex-President Jefferson, but suffered again by a fire in 1851, which reduced it to 20,000 volumes. It has increased rapidly since then (1) through appropriations by Congress; (2) by deposits under the Copyright Act (see COPYRIGHT); (3) by gifts and exchanges, particularly of public documents; (4) by the exchanges of the Smithsonian Institution, the library of which (40,000 volumes) was, in 1866, deposited in the Library of Congress with the stipulation that future accessions should follow. The collection has now come to be the largest in the Western Hemisphere and one of the half dozen largest in the world. It comprised on June 30, 1914, 2,253,309 printed books and pamphlets, 141,712 maps and charts, 663,474 pieces of music, 376,812 prints, and many manuscripts, including the papers of nine Presidents of the United States. It is rich in history, political and social science, public documents, and in Americana, including important files of American newspapers and original manuscripts (due in part to the acquisition of the Peter Force, the De Rochambeau, and other special collections); but it is now a library general in scope, and its purchases include material in every department of literature. The annual increase of the library amounts to about 125,000 volumes. From 1800 to 1897 it remained at the Capitol; in 1897 it was removed to the building erected for it under acts of Congress, at a cost of $6,347,000, exclusive of the land, which cost $585,000. The building occupies 3¾ acres upon a site 10 acres in extent, at a distance of 1270 feet east of the Capitol, and is the largest and most magnificent library building in the world. It has a floor space of nearly 8 acres; book stacks which contain about 100 miles of shelving and space for 3,540,000 octavo volumes, and 84,000 volumes of newspapers, able to be so extended as to accommodate over 4,000,000 volumes; and provision for nearly 1000 readers at a time. The structure, Italian Renaissance in style, is quadrangular, measuring 470 feet by 340 feet, and incloses four

THE LIBRARY OF CONGRESS
WASHINGTON

courts and a central rotunda. Its numerous works of art are imposing but very unequal in merit. Its organization is now highly elaborate, including besides the general administration various divisions: Order, Catalogue, Reading Rooms, Bibliography, Documents, Manuscripts, Maps, Music, Periodicals, Orientalia, Prints; the Law Library, which still remains at the Capitol; and the Copyright Office; also a branch bindery and printing office which are branches of the Government Printing Office. The total force employed in the library numbers over 500. The Librarian of Congress is appointed by the President of the United States. He appoints his subordinates and otherwise administers the appropriations granted for the Library and Copyright Office. There is also a Superintendent of the Building and Grounds, similarly appointed. Annual appropriations are granted by Congress upon application of these two officials. For the year 1914–15 they amounted to $649,665. The library is open from 9 A.M. to 10 P.M. on every week day, and from 2 P.M. until 10 P.M. on Sundays and most holidays. Established for the use of Congress, and still especially serving Congress, the library is now also a public library, national in scope and function. For reference it is freely accessible without formality; but the privilege of drawing books for home use is at present in general limited to members of Congress and certain other classes of officials. Besides its direct service to readers, equivalent in volume to that of any American library, and to Congress and the executive and scientific bureaus at Washington, the library gives much bibliographic information by mail and through its publications, which, including its annual reports and reference lists, are distributed freely to institutions and serious investigators. It issues no general catalogue in book form. Its printed catalogue cards are, however, placed for reference at certain centres of research outside of Washington, and are supplied at cost to subscribing libraries. It has thus become a central bureau for the cataloguing of all current copyrighted publications and of most others, current and noncurrent, that are of concern to American libraries.

Consult: for history, W. D. Johnston, *History of the Library of Congress* (Washington, 1904); for organization and workings, *Report of Librarian* for 1901 (ib., 1902); for description of the building, H. Small, *Handbook of the Library of Congress* (Boston, 1909); W. W. Bishop, *The Library of Congress* (Washington, 1914).

LIBRARY SCHOOLS. See LIBRARIES.

LIBRA'TION (Lat. *libratio*, a balancing, from *librare*, to poise, from *libra*, balance). A term applied to certain phenomena of the moon's motion. The moon's librations (or, more properly, *apparent* librations) are of three kinds—libration *in longitude*, libration *in latitude*, and the *diurnal* libration. If the moon's rotation in the orbit were uniform, as her rotation on the axis is, we should always see exactly the same portion of her surface; but as this is not the case, there are two small strips of surface, about 7° 45′ in width, running from pole to pole, on the east and west sides, which become alternately visible; this is called the moon's longitudinal libration. The libration in latitude arises from the moon's axis not being perpendicular to her orbit, in consequence of which a portion of her surface round the north pole is visible during one-half, and a corresponding portion round the south pole during the other half of her revolution in her orbit; the libration in latitude is about 6° 41′. The diurnal libration hardly deserves the name, and is really an effect of parallax. It arises simply from the fact that the observer is stationed on the surface of the earth, and not at the centre; it consists in the gradual disappearance of certain points on one edge of the moon's disk as she approaches her culmination, and the appearance of new points on her opposite border as she descends. The combined effect of all three librations is that we can see altogether 59 per cent of the moon's surface; whereas without the librations we should see a trifle less than 50 (49.998) per cent. Only about 41 per cent of the surface is at all times visible from the earth. The first and third of these librations were discovered by Galileo, and the second by Hevelius.

LIBRETTO, lė-brĕt'tō (It., little book). The book or text of any extended vocal composition, notably of an oratorio or opera. As the Italian opera degenerated the libretto became more and more trivial. During the latter half of the eighteenth and the first half of the nineteenth century the text was of so little importance that the same libretto would be retouched or slightly altered and set to music by many different composers. Serious composers always had difficulty with librettists. Beethoven for a long time wished to write operas, but after his experience with *Fidelio* abandoned dramatic composition forever, because he could not find a suitable text. Wagner began his reforms by insisting upon a good text. But, being a poet himself, he was not dependent upon others. The texts of his earlier works (to *Lohengrin* inclusive) are libretti in the true sense, being divided into arias, choruses, duets, quartets, etc. But they possess literary merit because of the logical and artistic development of the plot and the beauty and force of the language. It would be wrong to apply the term "libretto" to the text of Wagner's later works. They are dramas in the true sense of the word. The influence exerted by Wagner upon librettists has been so strong that since his time a poor or ineffective libretto is the exception. Consult Edgar Istel, *Das Libretto* (Berlin, 1914), and United States Library of Congress, Division of Music, *Catalogue of Opera Librettos Printed before 1800* (Washington, 1914).

LIBREVILLE, lē'br'-vēl'. The capital of the Gabun Colony, French Equatorial Africa, situated on the coast at the estuary of the Gabun (Map: Congo, A 2). It is an important seaport and coaling station. The population in 1911 was 1573 natives and 175 Europeans.

LIBRI CAROLINI. See CAROLINE BOOKS.

LIBRI-CARRUCCI, lē'brė-kȧ-rōō'chė, GUGLIELMO, COUNT (1803–69). A French mathematician. He was born at Florence and was educated at Pisa, where he was professor of mathematics and physics until 1830, when he went to Paris as a political refugee. He was naturalized in 1833; became professor of analysis at the Sorbonne; and succeeded Legendre in the Academy of Sciences. He was promoted to be inspector general of the University and of the public libraries of Paris. He was also an editor of the *Journal des Savants*. In 1847 he was accused of stealing valuable books and manuscripts under his charge; in 1850, after his escape to England, he was found guilty and was sentenced to 10 years' imprisonment. Among his really important works in mathematics and physics are contributions to Crelle's *Journal* (1835) and the *Histoire des sciences mathématiques* (1838–41 and 1865).

LIBRO D'ORO, lē'brō dō'rō (It., Golden Book). A book in which was inscribed, originally in letters of gold, a roll of all members of the nobility of Venice. All persons 25 years of age whose names were there registered were members of the Grand Council. The Golden Book of Venice was burned by Napoleon in 1797. Similar registers were kept in other Italian republics, and the term came to mean in general any list of honors.

LIBUR'NÆ NA'VES. See LIBURNIA.

LIBUR'NIA (Lat., from Gk. Λιβουρνία, *Libournia*). In ancient geography, a mountainous district of Illyricum on the Adriatic coast, and the adjacent islands, now a part of Croatia and Dalmatia. From early times the Liburni were daring seamen, and were in the possession of Corcyra, Issa, and other islands when the Greeks occupied these places. They were noted pirates, and their privateers, with large lateen sails, were for centuries the terror of the seas. Later Liburnia was included in the Roman Province of Dalmatia, and the Liburni served in the Roman navy. The galleys of the Liburni were noted for their light construction and swiftness, and the Romans, adopting this style of naval architecture, called all fast-sailing vessels *naves Liburnæ*. By means of these light galleys Augustus gained the battle of Actium. The only important towns in Liburnia were Iader and Scardona. For authorities consult the article "Liburni" in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

LIBUR'NUM. See LEGHORN.

LIBUSSA, lē'bụ-shȧ. An opera by Smetana (q.v.), first produced in Prague, June 11, 1881.

LIBYA, lĭb'ĭ-ȧ (Lat., from Gk. Λιβύη, *Libyē*). The name given by the oldest geographers to the whole continent of Africa. In the Roman period the name Africa was generally used for the continent as a whole, while the name Libya was applied specifically to what is now known as the Libyan Desert (q.v.), together with the strip of land just north thereof, lying along the coast, and corresponding in part to Tripoli. See AFRICA.

LIBYAN, lĭb'ĭ-an (*Luba*, *Levata*, Egypt. *Lebu*, Gk. Λίβυες, *Libyes*). A branch of the Hamitic stock, or linguistic family, occupying from most ancient times the north of Africa between the Barcan Desert and the Atlantic Ocean. They include in Morocco *Amazirg* (Berbers), *Rifians*, and *Shelhas* (Shluhs); in Senegal, *Senagas;* in the Desert, *Tuaregs* and *Tibbus;* in Algeria, *Kabyles*, *Shawia*, and *Beni-Mzab* (Mzabites); in Tripolitana *Zouaves* and *Jelel*, and *Ghadames*, southward.

The Libyan people are of medium stature (5 feet, 7 inches) and in build are spare, but strong. They are fair-skinned, and much lighter than the average fellah of the Nile or than the Arabs. Dark hair and hazel eyes are more frequent than light hair and blue eyes, though in all villages persons resembling the North German type are to be seen. It is interesting to note how this mark has persisted. On the walls of the tomb of Seti I and Merenptah (1300 B.C.), at Thebes, are shown four types, representing the Egyptian, the Asiatic, the Negro, and the Libyan. The Egyptians are painted red, but the Libyans are white, with blue eyes and fair beards, preserved until this day in the blond Berber, from Tripoli to Tangier and far into the desert.

The home of the Libyans is for the most part a mountainous region, here and there lifted above the snow line and flanked by a piedmont on north and south, the former sloping into the Mediterranean, the latter towards the Sahara.

As distinguished from the nomadic and predatory Arabs, the Libyans are and have been partly agricultural, partly industrial, and partly commercial. The difficult traffic across the Sahara into the Negro Sudan has been theirs from time immemorial. For the prosecution of this commerce horses, camels, and asses were needed, and the rearing of these gave variety to their activities. Agriculture has always been their congenial pursuit. In the narrow valleys terraced gardens are common, but in the wider, more open spaces the plow takes the place of the hoe and the implements seem not to have changed their form in many hundreds of years. The Libyans possess little mechanical skill, as is evidenced by their mills, looms, and metallurgy. Pottery is made by hand, without the wheel, by modeling or building up by coils, and burnt in little kilns in the open air. In some tribes, the Kabyles (q.v.), e.g., the forms and decorations remind the student of the most ancient ceramics of Egypt.

The dress of the Libyans of to-day is for the men a cotton or woolen undergarment and over this a burnoose, consisting of blankets sewed together and having a capuchin hood attached. Sandals with soles of plaited grass complete the costume. To this a caida (*Kaid*) will add a scarf, loose tunic, sleeved waistcoat, embroidered waistcoat, a girdle, and a turban, besides a rosary, boots or stockings of red leather, and large black shoes.

The women wear a single tunic of coarse material, with holes for the arms, tied up at the waist with a girdle. A profusion of silver ornaments is common, and finer garments with gay headdress are worn on festive occasions.

The unit of Libyan social life is the monogamous family; in which the women do not go veiled, but custom lays on them many restrictions. The unit of political life is the village community, with purely democratic government, unless outside influences have prevented, as among the Tuaregs. The presiding officer of the general assembly has no power of initiative, but is the servant of the village. Villages are united into tribes, for geographic and economic reasons, and these in great emergencies unite in confederacies. Beneath this democratic system and modifying its action exist secret societies or organizations which are sworn to protect their members in every difficulty. Excepting on the rarest occasions the Libyans have never developed a national spirit.

The Libyans or Berbers have been Mohammedans since the seventh century. Herodotus says that the Libyan nomads sacrificed to the sun. Egyptian, Greek, and Roman polytheisms, singularly enough, make little impression on them. Beyond nature worship and the wearing of charms they were almost without a cult. Consult: Randall-MacIver and Wilkin, *Libyan Notes* (London, 1901); Arnold van Gennep, "Etudes d'ethnographie algérienne," in *Revue d'Ethnographie* (Paris, 1911); Franz Stuhlmann, *Ein kulturgeschichtlicher Ausflug in den Aures* (Hamburg, 1912); Bertholon and Chantre, *Re-*

cherches anthropologiques dans la Berbérie orientale (Lyons, 1913). See BERBER, and the various Libyan tribes under their special designations.

LIB′YAN DESERT (Lat. *Libyæ deserta*). That part of the African continent lying between Egypt and Fezzan and extending from the Mediterranean to Darfur. It contains a number of oases, or fertile tracts, islands of verdure in the vast sands, which support a sparse population; but the surface generally consists of irreclaimable sandy or gravelly plains, separated by low rocky ridges, or shelving down in a series of terraces towards the Mediterranean. Consult J. C. S. Falls, *Drei Jahre in der libyschen Wüste* (Freiburg, 1911; Eng. trans. by E. Lee, London, 1913), and F. G. Alexander, *Wayfarers in the Libyan Desert* (New York, 1912). See LIBYA.

LIBYAN LANGUAGE. See AFRICAN LANGUAGES.

LIBYAN SEA (Lat. *Mare Libycum*). The name given in ancient geography to that part of the Mediterranean which lies between the island of Crete and the coast of Africa.

LICATA, lē-kä′tȧ, or **ALICATA**, ä′lē-kä′tȧ. The most important city commercially on the south coast of Sicily, at the mouth of the Salso, in the Province of Girgenti, 137 miles by rail southeast of Palermo (Map: Italy, D 6). It is beautifully situated on the lower slopes of the hill of Sant' Angelo, known as Ecnomus to the ancients. It has a Gothic church and a technical school. The principal export is sulphur. The country produces grain, wine, olives, fruit, cheese, wool, hides, and cotton, and the sea yields anchovies and sardines. Here in 256 B.C. Regulus (q.v.) vanquished the Carthaginians in the naval battle of Ecnomus, and in 249 Carthalo, favored by a storm, destroyed a fleet of Roman transports. Pop. (commune), 1901, 22,031; 1911, 24,530.

LI′CENSE (OF., Fr. *licence*, It. *licenza*, from Lat. *licentia*, license, from *licere*, to be permitted). In music, the liberty which a composer takes in deviating from the rules of his art, and which is often marked with the words *con licenza* in order to indicate that it has been introduced intentionally to produce some unusual effect. Many licenses occur, however, in the works of great composers like Mendelssohn, Bach, and Haydn, where the notice *con licenza* is omitted, but it will generally be found that they are introduced for the purpose of characterization. Especially in dramatic music much license is permitted in order to obtain characteristic expression, such as leading voices in open fifths or doubling intervals that ought not to be doubled according to the rules of strict writing.

LICENSE. In general, an authority given by one person to another to do an act which but for such authority would be an infringement of the licensor's rights or a violation of a prohibitive statute or regulation. Specifically the term includes licenses by a landowner to enter upon or otherwise use his land, usually for a temporary purpose, and licenses by municipal or other public authority to ply certain trades or callings.

Licenses of the former sort cover a wide range of permissive use of the licensor's property. They may or may not be based on a consideration, but in neither case do they confer on the licensee any right or interest entitling him to assert the privilege or authority conferred by the license, but are revocable at the will of the licensor and are revoked *ipso facto* by his death or alienation of the property. Of this kind are licenses to fish or hunt or cut wood on the licensor's property, to witness a theatrical performance or athletic game or other sporting event, to enter and dine in a restaurant, and the like. As has been said, the privilege confers no right on the licensee to remain in the place which he has been licensed to enter nor to continue the use thereof after the license has been revoked. If the licensee has paid for the privilege, as for a theatre ticket, his only remedy is in contract for the damages sustained by him through the breach. The only qualification of this rule is in the case when a license is "coupled with an interest," or property right, in the premises, as where a tenant in an apartment house has a license to use the stairs or elevator to reach his apartment. In such case the license is irrevocable so long as the interest continues.

Licenses are classified as *executory*, when not yet acted upon, and *executed*, when acted upon. It is sometimes said that "a license executed is not countermandable," but this is generally true only in the sense that the revocation of a license does not have a retroactive effect so as to convert into a trespass an act which was performed while the license to perform it was still in effect. In two cases, however, the doctrine that an executed license is not revocable is literally applied, viz., where one having an easement in another's land licenses the servient tenant to erect a wall or other structure on his own land which has the effect of preventing the further use of the easement, and where a person licenses his neighbor to erect on his own land a dam or other structure which interferes with the licensor's enjoyment of his land, as, e.g., by backing up water upon it. In neither case can the licensor recall the authority he has given and require the licensee to undo what he was licensed to do or hold him liable for the damage resulting therefrom. In one or two of the United States it has been held that a person who has paid for a seat in a theatre and taken possession, or who has at great expense erected a dam or mill in pursuance of a license so to do, is protected against a revocation, but such cases are exceptional. It is generally held, however, that where a license is based upon a consideration and where it purports to confer upon the licensee a permanent right to use the licensor's land in a specific way, as to dam back the water of a stream upon it or to convey water by a pipe through it, the courts of equity will restrain the licensor by injunction from interfering with the executed arrangement, on the principle of the specific performance of contract. See EASEMENT; REAL PROPERTY, and authorities there referred to.

The most common licenses of the second sort are licenses to sell liquor, to exercise the trade or calling of a peddler, to give theatrical or other public entertainments, to hold public meetings, to use the streets for processions, etc. Such acts are in themselves innocuous and do not constitute a violation of the common law, but are generally restricted by statute or by local municipal ordinances in the interest of public order and safety. Such licenses are a matter of statutory regulation, and, as they are usually granted only on payment of an annual fee, they are frequently resorted to by the state or by a municipal corporation as a revenue measure. A heavy license fee is sometimes imposed for the purpose of discouraging or restricting a calling which is deemed by public authority to be obnoxious to the interest or welfare of the community. This is the method which has commonly been employed in the United States, as an alternative to the policy of prohibition, for regulating the traffic in, and for diminishing the use of, intoxicating liquors. See INTOXICATING LIQUORS; LIQUOR TRAFFIC.

The term "license" is used in international law for the authority given by a state engaged in war to its subjects or the subjects of the state with which it is at war, to engage in a trade forbidden in time of war. The right to give such licenses is original with the sovereign power, and they may be given by commanding officers in the army or navy as its delegates.

A license in patent law is a permission to make or sell a patented article. To be legally effective, it is required by act of Congress to be duly executed in writing and to be filed in the United States Patent Office at Washington. See PATENT.

LICEN′TIATE (ML. *licentiatus*, p.p. of *licentiare*, to license, from Lat. *licentia*, license). A university degree between that of bachelor and doctor or one holding that degree. It is used somewhat in Europe to indicate a person who has taken certain examinations and is licensed to lecture.

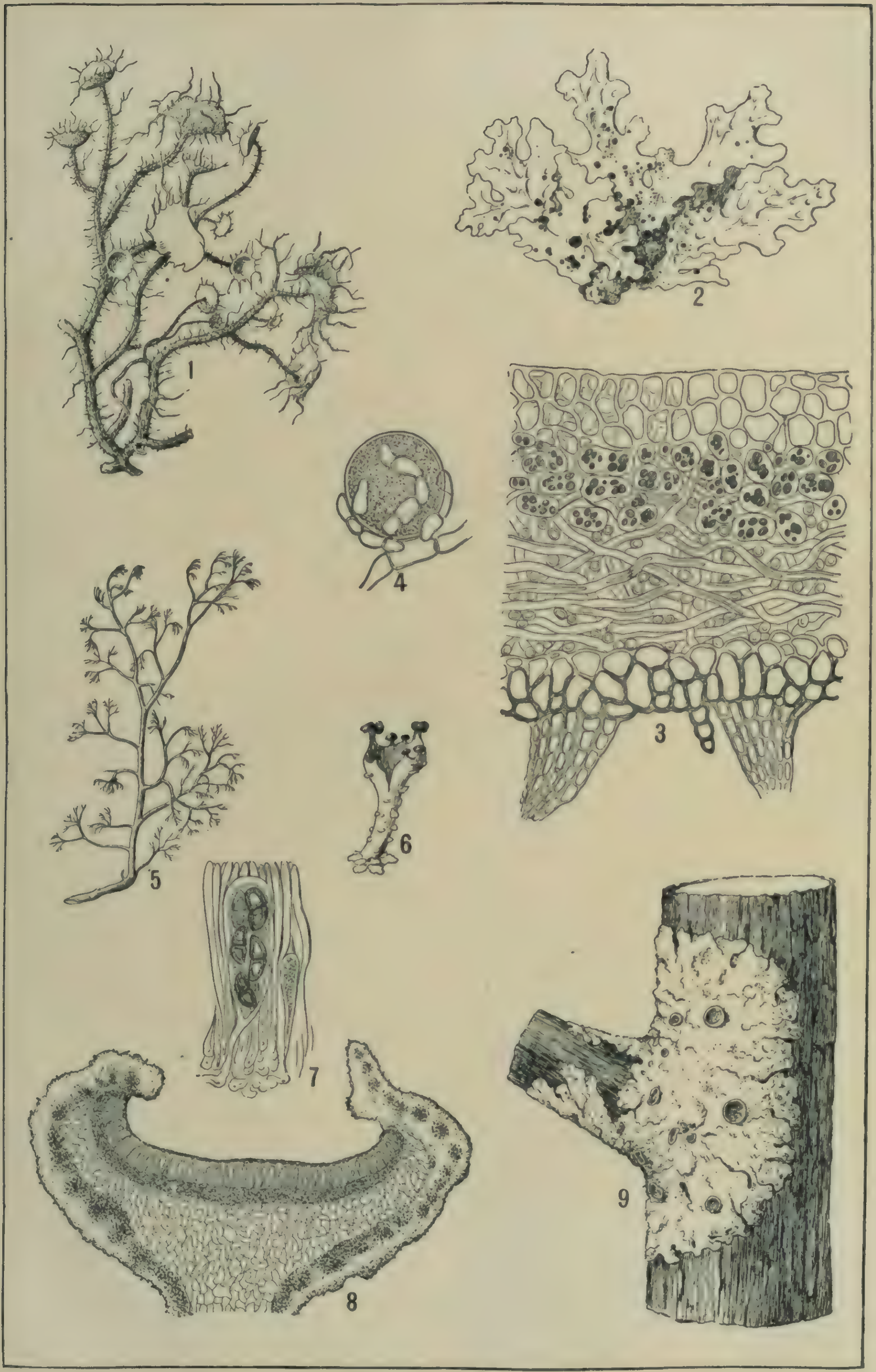
LICHAS, lī′k*a*s (Neo-Lat., from Gk. λιχάς, space between the thumb and forefinger). An interesting genus of fossil trilobites found in rocks of Ordovician and Silurian age. The genus is characterized by broad flat carapaces, short wide head, small eyes, and peculiar lobation of the central portion of the head shield. The genus has several allies, especially in the Devonian, that have the most extravagant spinose ornamentation. One of the simpler forms, *Lichas bigsbyi*, is a well-known characteristic index fossil of the Niagara group. See TRILOBITA.

LICHEN, lī′kĕn (Lat. *lichen*, from Gk. λειχήν, *leichēn*, λιχήν, *lichēn*, tree moss, ringworm; possibly connected with λείχειν, *leichein*, Skt. *rih*, *lih*, OChurch Slav. *lizati*, Lat. *lingere*, to lick, OIr. *ligim*, I lick, OHG. *leokōn*, Ger. *lecken*, AS. *liccian*, Eng. *lick*). A dry, papular disease of the skin. Formerly there existed considerable confusion in the use of the term; but since the time of Hebra, the Vienna master, it has been limited to (1) *lichen scrofulosum* and (2) *lichen ruber*. The former has now been definitely classed among the cutaneous tuberculoses, leaving *lichen ruber* as the only affection regarded by dermatologists as entitled to the name. In most cases, especially in neurotic subjects, there is much itching, which provokes destructive scratching. The disease is an affection of nervous origin, following sorrow or violent nervous emotions, and is often accompanied by insomnia, agitation, and headache. Hot sedative douches, arsenic, and proper diet and hygiene produce good results, aided by external application of carbolic acid, pilocarpine, mercury, lead, chrysarobin, and the curette. Consult H. W. Stelwagon, *Essentials of Diseases of the Skin* (7th ed., Philadelphia, 1909).

LICHENIN, lī′kĕn-ĭn. A gum found in Iceland moss, from which it is extracted by digesting the moss in a cold, weak solution of carbonate of soda for some time and then boiling. By this process the lichenin is dissolved and on cooling separates as a colorless jelly. Iodine imparts no color to it. Glacial acetic acts upon it, yielding a tri-acetyl derivative. Lichenin is accompanied in Iceland moss by another gum, known as *iso-lichenin*, which, unlike lichenin, is colored blue by iodine and does not react with glacial acetic acid.

LICHENS, lī′kĕnz (Lat. *lichen*, from Gk. λειχήν, *leichēn*, λιχήν, *lichēn*, lichen). A very large group of plants, forming splotches of various colors on tree trunks, rocks, old boards, etc., and also growing upon the ground and hanging in clusters from the crowns of trees. They may resemble incrustations on these various supports; or they may form very definite flat and lobed bodies that are not attached throughout to their supports; or they may form slender branching bodies that are erect, hanging, or prostrate. The so-called reindeer moss is an erect branching lichen, common in north latitudes; and in certain mountain regions trees are frequently thickly covered with the hanging lichens. Lichens seem to require pure air and are scarce in the neighborhood of cities. The most important fact about a lichen is that it is made up of two very different plants, a fungus and an alga; but these two are so closely associated that they seem to belong to a single body. In fact, a lichen is a parasitic fungus that obtains its food supply from certain algæ and in doing so enwraps the alga completely. Apparently the algæ are not injured, and in fact their position in the midst of a moist, spongelike body is very favorable for their work. This means that in this position the algæ manufacture food enough for themselves and for the fungus, for otherwise they would be destroyed. This association, known as symbiosis, has led to some very important results. It makes it possible for the two plants to exist in conditions that would be impossible for either plant alone. For example, lichens are abundant on bare rocks from which all other plants are absent. In ascending mountains, after all other vegetation has disappeared, the lichens persist on the most exposed rocks. In such places the alga could not grow alone because of lack of moisture, and the fungus could not grow alone because of lack of food; but in the spongelike body of the fungus the alga gets its moisture, and from the enmeshed alga the fungus gets its food. This fact is important because lichens can thus start soil formation on bare and exposed surfaces. The materials of their dead bodies give to other plants a chance to grow, and so a soil gradually accumulates. With few exceptions lichens are Ascomycetes (q.v.), parasitic upon algæ belonging for the most part to the Cyanophyceæ (q.v.) and Protococcales. (See CHLOROPHYCEÆ.) The dual nature of lichens was announced by Schwendener in 1868, but it was many years before the proof of it became convincing. In 1889 Bonnier began to synthesize lichens, that is, to bring together "wild algæ" and lichen fungi, and thus produce artificial lichens. The lichen fungus usually forms a thallus body, much more definite and differentiated than other mycelia (see FUNGI), the thallus often resembling in form that of certain liverworts. In structure there is a distinct, compact cortical region and a central looser region, in either of which the algæ may occur. On the basis of habit, three types are recognized: (1) crustose lichens, with an undefined mycelium, often penetrating the substratum; (2) foliose lichens, with a definite liverwort-like thallus, which has marginal growth and rhizoids; and (3) fruticose lichens, which are erect and often branching, or pendent and branching. Vegetative mul-

LICHENS



1. USNEA.
2. STICTA.
3. SECTION OF STICTA, showing algal cells surrounded by fungal filaments.
4. AN ALGAL CELL with investing fungal filaments, from Cladonia.
5. CLADONIA, the "Reindeer Moss".
6. THE SPORE-BEARING PORTION OF CLADONIA.
7. AN ASCUS with two-celled spores, from Fig. 8.
8. SECTION OF "FRUIT", from Anaptychia.
9. PHYSCIA.

tiplication is secured by soredia, which are scalelike or globular bodies composed of a little tangle of mycelium with some algal cells. The ascocarps are very conspicuous structures, usually being disklike forms.

Bibliography. Edward Tuckerman, *Synopsis of the Lichens of New England, the Other Northern States, and British America* (Cambridge, 1848); id., *Genera Lichenum: An Arrangement of the North American Lichens* (Amherst, 1872); A. Schneider, *Guide to the Study of Lichens* (Boston, 1898); F. L. Sargent, *Lichenology for Beginners* (Cambridge, 1906); N. L. Marshall, *Mosses and Lichens* (New York, 1907); E. H. Hale, *Flowerless Plants* (ib., 1909); G. E. Massee, *British Fungi* (ib., 1912).

LICH'FIELD. An ancient city in Staffordshire, England, a civic county, 15 miles southeast of Stafford (Map: England, E 4). Considerable brewing is carried on, together with market gardening and manufacturing of harness, carriages, and carpets. Its chief edifice is the cathedral, a red sandstone building of fine proportions in the early English style, dating from the thirteenth and fourteenth centuries and occupying a commanding site. Its length is 403 feet; width of transepts, 149 feet; of nave, 65 feet; and height, 60 feet. It is surmounted by three spires, the central spire being 260 feet high, and the two western spires each 190 feet high. Other notable features are the western façade, ornamented with one hundred statues in niches; the triforium, the Lady Chapel, and several fine monuments. The cathedral, formerly surrounded by a wall, was besieged and damaged greatly by the Puritans in 1643. It was restored by Wren, who built the central spire; at the end of the nineteenth century it again underwent a complete restoration. Adjacent to the cathedral is the close containing the picturesque episcopal palace on the north side, with a flourishing theological college on the south. The city also contains a museum and public library, a probate court, and the ancient hospital of St. John. Lichfield has a free grammar school, in which Addison, Ashmole, Johnson, and Garrick, natives of the town or vicinity, were educated. The market place contains a colossal statue of Dr. Johnson, whose birthplace is preserved and contains many relics of the great lexicographer. Lichfield was made an episcopal see in 669, and received its city charter in 1549. Pop., 1901, 7900; 1911, 8616. Consult John Britton, *History and Antiquities of the See and Cathedral of Lichfield* (London, 1836); W. Beresford, *Lichfield* (ib., 1883); A. B. Clifton, *Cathedral Church of Lichfield*, in "Bell's Cathedral Series" (ib., 1898).

LICH GATE (from *lich*, AS. *līc*, OHG. *līh*, Ger. *Leiche*, Goth. *leik*, corpse, body + *gate*), or CORPSE GATE. A churchyard gate with a porch or shed attached. Such gates are common in many parts of England. The bodies of persons brought for burial are set down under the shelter of the roof while the service is read.

LICHI NUT. See LITCHI.

LICHTENBERG, lĭk'ten-bĕrk. A residential suburb of Berlin, on the east, practically a part of the capital (Map: Germany, J 5). It was united with Rummelsburg-Boxhagen in 1912. It contains many philanthropic institutions of Berlin and manufactures ironware, pharmaceutical implements, railway signals, stoves and heaters, pianos, leather goods, carpets, and dyes. Pop., 1900, 43,372; 1910, 81,199.

LICHTENBERG, GEORG CHRISTOPH (1742–99). A German physicist and satirist, born at Oberramstadt, Grand Duchy of Hesse. He received his first instruction in mathematics and physical studies from his father, and after studying at Göttingen was appointed professor in the University of Göttingen in 1769. At the end of that year he went to England, where he mingled and studied with many of the leading scientists of his day. The results of his investigations appeared later in numerous discoveries in the field of electricity, of which the most important were the electrical figures named after him. In England he became a frequent visitor to, and student of, the theatre in which Garrick was then a distinguished figure. Moreover, a keen observer by nature and training, in his study of English literature he was soon impressed by the inferiority of the German wit to that of such men as Swift, after whom he later patterned to some extent his own satiric method. After a second visit to England (1774–75), he resumed his lectures on experimental physics at Göttingen. He continued, however, to devote much time to literary pursuits. His keenness of wit and his boundless resources of ridicule resulted in his publication of several well-aimed satires, of which the best known are his *Ueber Physiognomik wider die Physiognomen*, against the new science of physiognomy of Lavater (q.v.), and his *Ueber die Pronunciation der Schöpse des alten Griechenland*, against Voss. From 1778 he edited the *Göttingscher Taschenkalender*, in which he severely attacked the Storm and Stress writers. Here he published in part his articles on Hogarth, whom he did much to popularize in Germany. In the completed work, the *Erklärung der hogarthischen Kupferstiche* (1794 et seq.), he gave the most brilliant proof of his critical power by his clear explanation and interpretation of the English artist's work. In later years he was affected by hypochondria, but, though forced to withdraw from society, continued his studies and writings. His *Gedenkbücher*, or Diaries, contain interesting maxims, epigrams, and brief essays. Consult Franz Lauchert, *Lichtenbergs schriftstellerische Thätigkeit* (Göttingen, 1893); E. Ebstein, *Aus L's Korrespondenz* (Stuttgart, 1906); Alex. von Gleichen-Russwurm, *Zur Einführung in G. C. Lichtenberg* (Jena, 1907).

LICHTENBERG, LEOPOLD (1861–). An American violinist, born in San Francisco. He first appeared in public at the age of eight. Four years later he came under the tuition of Wieniawski and toured with him through the United States. Subsequently he was for six months under Lambert in Paris, rejoined Wieniawski in Brussels, and, devoting himself for three years to serious study, was enabled to win a first prize at the national "concours." He returned to America; in 1877 was soloist for the Theodore Thomas concerts; made a three years' tour of Europe; then became a member of the Boston Symphony Orchestra; and was appointed head of the violin faculty of the National Conservatory of Music, New York. Together with Adèle Margulies (piano) and Leo Schulz (cello) he formed the Margulies Trio, which soon ranked with the foremost chamber-music organizations of the United States.

LICHTENBERGER, lĭk'ten-bĕr-gĕr, FRÉDÉRIC AUGUSTE (1832–99). A French theologian, born at Strassburg. He obtained his degree in theology and was made professor at the university of his native town (1864). In 1877 he was appointed professor in the newly founded Protestant faculty at Paris, of which he also became dean. His publications include: *La théologie de Lessing* (1854); *De Apostolorum Præceptis Redemptoriam Christi Mortem Spectantibus* (1857); *Etude sur le principe du protestantisme* (1857); *Des éléments constitutifs de la science dogmatique* (1869); *Histoire des idées religieuses en Allemagne depuis le milieu du XVIIIème siècle* (1873; 2d ed., 1887).

LICHTENSTEIN, lĭκ′ten-stīn, Martin Heinrich Karl (1780–1857). A German traveler and zoölogist. He was born at Hamburg and studied medicine at Jena and Helmstedt. He went as physician and tutor with the Dutch General Janssens to South Africa (1801) and served as surgeon to an infantry battalion of Hottentots and as governmental commissioner to the Bechuanas (1805). In 1806, on the occupation of the colony by the English, he returned to Germany, devoting himself to the study and classification of the zoölogical and especially ornithological material he had collected in Africa. In 1811 he was made professor of zoölogy at Berlin, and two years afterward was appointed to succeed Illiger as director of the Zoölogical Museum, which under his supervision became one of the greatest on the Continent. His more important publications were *Reisen im südlichen Afrika* (1810–11) and *Darstellungen neuer oder wenig bekannter Säugetiere* (1827–34).

LICHTENSTEIN, Ulrich von. See Ulrich von Lichtenstein.

LICHTWER, lĭκt′vĕr, Magnus Gottfried (1719–83). A German fabulist. He was born at Wurzen, studied law at Leipzig and Wittenberg, and was subsequently canon of St. Mauritius. His chief work is to be found in the *Vier Bücher aesopischer Fabeln* (1748). Some of these are still popular. There is a collection of *Schriften* (1828) edited by von Pott and Cramer. Consult J. Minor, *Fabeldichter, Satiriker des 18. Jahrhunderts* (Stuttgart, 1884).

LICIN′IAN ROGA′TIONS (Lat. *rogationes Liciniæ*, from *rogare*, to ask; used of the magistrate who asked the people whether it approved a proposed law). A rogation was the term for a bill proposed by a Roman magistrate for incorporation in the laws of the state. In 367 B.C., after a struggle of almost 10 years, the tribunes Licinius Stolo and Lucius Sextius secured the adoption of a law that put an end to the long strife between the patricians and the plebeians. It provided (1) that the office of consular tribune should be abolished, and that one of the two consuls should be a plebeian; (2) that no one should hold more than 500 *iugera* (about 250 acres) of the public land; (3) that no one should pasture more than 100 cattle or 500 sheep or goats upon the public lands; and (4) the easy payment of accumulated debts. The first plebeian consul under the new law was Lucius Sextius himself. Consult G. W. Botsford, *The Roman Assemblies*, Index, s.v. "Leges Licinia Sextia" (New York, 1909), and the authorities cited under "Lex, 52," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Munich, 1914). See Agrarian Laws.

LICIN′IA′NUS, Granius. A Roman historian. See Granius Licinianus.

LICINIO, lē-chē′nē-ō, Bernardino. A Venetian painter of the Renaissance. (Active 1520–44.) The dates of his birth and death are unknown, but he was born at Pordenone, and was a pupil of his relative, the great Pordenone (q.v.). Later he was influenced by Giorgione, Palma, and Bonifazio. He was one of the first to paint family portrait groups. Several of these survive, all representing an artist surrounded by his family and pupils, of which good examples are in the Borghese Gallery, Rome, at Hampton Court, and at Alnwick Castle. He is better known, however, for his single portraits, including those of Ottaviano Grimani, in the Vienna Gallery; "A Young Man," in the National Gallery, London; "A Lady Seated," in the Dresden Gallery. He also painted religious pieces, of which a "Madonna Enthroned," in the church of the Frari, Venice, is a real masterpiece, brilliant in color and filled with vitality, though not elevated in conception.

LICIN′IUS, Gaius Flavius Valerius (c.270–324). A Roman emperor. A Dacian or Illyrian by birth, he entered the Roman army and rose to high command. The Emperor Galerius (q.v.), a comrade in old campaigns, made him Augustus (307), after the death of Flavius Valerius Severus, with control of Pannonia and the Alpine district. Galerius died in 311, and Licinius strengthened himself in the West by marrying the half sister of Constantine and by concurring in the Western Emperor's edict of toleration of the Christians. By his defeat of Maximinus (q.v.) at Adrianople, Licinius became sole Eastern Emperor. But he soon quarreled with Constantine. He was defeated near Cibalæ in Pannonia (314) and gave up to Constantine his European domain, except Thrace and a part of Mœsia. Having taken up arms again and been defeated a second time by Constantine at Adrianople and Chrysopolis, near Chalcedon in Bithynia (323), he surrendered and was executed for treason, in spite of promises that his life would be spared. Consult *Cambridge Mediæval History*, vol. i (New York, 1911).

LICINIUS CRASSUS. See Crassus.

LICINIUS MACER CALVUS, Gaius. See Calvus, Gaius Licinius Macer.

LICIN′IUS STO′LO, Gaius. A Roman statesman, tribune of the people in 377 B.C., consul in 361. He was one of the authors of the Licinian Rogations (q.v.). Tradition said that he was himself fined for using a larger amount of the public lands than was allowed by the Licinian Rogations.

LICK, James (1796–1876). An American philanthropist, born at Fredericksburg, Pa. He was early a pianoforte manufacturer in Philadelphia, Buenos Aires, Valparaiso, and elsewhere. In 1847 he settled in California, where he invested in real estate and made a fortune. In 1874 he placed $3,000,000 in the hands of seven trustees, to be devoted to certain specified public and charitable uses. He twice appointed a new board of trustees. Lick's principal bequests were: to the University of California for the erection of an observatory, and procuring therefor a telescope superior to and more powerful than any before constructed, $700,000; to found an old ladies' home in San Francisco, $100,000; for the erection and maintenance in San Francisco of free public baths, $150,000; for the erection of three groups of bronze statuary, representing three periods in the history of California, to be placed before the city hall of San Francisco, $100,000; to erect in Golden Gate Park a bronze monument to Francis Scott Key, $60,000; to found and endow the California

School of Mechanic Arts in San Francisco, $540,000. See LICK OBSERVATORY.

LICK′ING RIVER. A river of Kentucky. It rises in the southeast corner of the State (its headwaters originating about 20 miles west of the Cumberland Mountains), flows in a generally northwesterly direction (its total length being about 350 miles), and empties into the Ohio opposite Cincinnati (Map: Kentucky, G 3). At high water small steamboats can ascend to Falmouth, a distance of 60 miles.

LICK OBSERVATORY. An astronomical observatory situated on Mount Hamilton, an eminence in the Coast Range, California, 4209 feet high, and about 13 miles east of San Jose. It is reached by a carriage road 25 miles long but of easy ascent. The observatory, which was completed in 1888, constitutes the astronomical department of the University of California. The advantages gained by this particular situation are an unobstructed view for a radius of 100 miles, and opportunity for observation during the greater part of the year, clear nights occurring regularly for six or seven months. The great telescope is the second largest refracting telescope in the world, the objective having a clear aperture of 36 inches, and is surpassed only by the 40-inch telescope at the Yerkes Observatory (q.v.) near Chicago. It has a focal length of 57 feet, 10 inches, and the cast-iron column on which it rests has a dimension at the base of 17 feet north and south and of 10 feet east and west. The point of suspension of the telescope tube is 36 feet from the floor. The dome, which has an exterior diameter of 76 feet, is moved by water power, as is the observation platform. A smaller dome contains a 12-inch telescope. In front is a piazza, and on the back a plain of about 100 yards in extent has been made by blasting off a peak of the mountain. Upon this a meridian circle is mounted; also a transit instrument and a photoheliograph. On a slightly lower hill, 1200 feet to the south, is a 3-foot reflecting telescope, that formerly belonged to Crossley of England. A lens for photography has been so arranged that it can be attached to the end of the big telescope. The entire fund for the construction of this observatory was given by James Lick. See LICK, JAMES.

LIC′ORICE, or **LIQ′UORICE** (OF. *licorice*, from Lat. *liquiritia*, corrupted from *glycyrrhiza*, Gk. *γλυκύρριζα*, *glykyrrhiza*, licorice plant, from *γλυκύς*, *glykys*, sweet, + *ῥίζα*, *rhiza*, root), *Glycyrrhiza*. A genus of perennial herbs of the family Leguminosæ, the members of which have long, pliant, sweet roots and generally creeping rootstocks; odd-pinnate leaves of many leaflets; flowers in spikes, racemes, or heads. The roots are valuable because of a yellow transparent, uncrystallizable substance called glycyrrhizin, allied to sugar, soluble in both water and alcohol, and used in medicine, being a constituent of many cough mixtures. The common licorice (*Glycyrrhiza glabra*), native of the south of Europe and of many parts of Asia, has stems three to four feet high and racemes of whitish violet-colored flowers. It is cultivated in many parts of Europe, chiefly in Spain and Russia. It has been grown to a limited extent in Louisiana and California. The roots are extensively employed by porter brewers. They are imported into the United States in considerable quantity, and the black concentrated extract of them (black sugar or stick licorice) is largely imported from the south of Europe, in rolls or sticks, packed in bay leaves. After a plantation has been made, almost three years must elapse before the roots can be dug for use. Licorice requires a deep, rich, loose soil, well manured. The roots penetrate to the depth of more than a yard; straight taproots are most esteemed. The plant is propagated by cuttings of the rootstocks, but when once planted the ground will be stocked for many years because the small pieces of root left after digging will grow. The plant is likely to prove a pest upon land suitable to its growth. The roots of the prickly licorice (*Glycyrrhiza echinata*) are used in the same way, chiefly in Italy and Sicily, Russia, and the East. *Glycyrrhiza lepidota*, an indigenous species, is found from Minnesota to Wisconsin, New Mexico and westward, and sometimes sporadically in the East.

LICORICE.

LIC′TOR. The official attendant of a magistrate in ancient Rome. The origin of the name is obscure; ancient writers derive it from *ligare*, 'to bind,' because it was the lictor's duty to bind criminals for execution, or because he bound them figuratively in the punishment of their wrongdoing; to this view it has been objected that the proper form of the word, if it is derived from *ligare*, would be *ligator*. Many modern scholars connect the word with a verb *licere*, 'to summon,' not actually found in Latin authors; they think of the lictors as summoning citizens to the *Comitia* (q.v.) or summoning accused persons before a magistrate. In kingly Rome the lictors were 12 in number and served as personal attendants of the King. Under the Republic the consul had 12, the dictators 24, the *magister equitum* 6, and the prætor 2. In the provinces, the proconsul had 12 and the proprætor 6. During the first century of the Empire the Emperor was attended by 12 lictors; but Domitian increased the number to 24. Afterward, however, the office was wholly abolished. Besides those attached to the persons of the civil magistrates, other lictors were assigned to the high religious functionaries. The chief priest (*pontifex maximus*) had 12, the priest of Jupiter (*flamen Dialis*) 6; and when a vestal virgin went through the streets she was accompanied by a lictor. During the Republic the lictors were men of plebeian rank, under the Empire largely freedmen (*libertini*). They wore the toga, and walked in single file before the magistrate, each bearing on his left shoulder the *fasces* (q.v.). They scourged offenders; in the earliest days, when the death penalty was still in force, they acted as executioners. Their duty was to clear the road for the magistrate, see that his authority was respected, and, in general, execute his orders. Consult Theodor Mommsen, *Römisches Staatsrecht,* vol. i (3d ed., Berlin, 1887), and the article "Lictor" in William Smith, *A Dictionary of Greek and Roman Antiquities,* vol. ii (3d ed., London, 1891).

LI′CUS. See Lech.

LID′DELL, Henry George (1811–98). An English classical scholar. He studied at Charterhouse School, then at Christ Church, Oxford, from which he graduated in 1833 with highest honors. He was headmaster of Westminster School from 1846 to 1855 and in 1862 became chaplain extraordinary to the Queen. In 1855 he was made dean of Christ Church and was vice chancellor from 1870 to 1874. He wrote a *History of Rome from the Earliest Times to the Establishment of the Empire* (1855), but he is best known as the author, together with Dean Scott, of the standard *Greek Lexicon* (1843; 8th ed., 1897), based on the Greek lexicon by Passow (q.v.). This is the best available Greek-English lexicon. Consult H. G. L. Thompson, *Henry George Liddell* (London, 1899).

LIDDELL, Mark Harvey (1866–). An American scholar, born at Clearfield, Pa. Educated at Princeton (A.B., 1887), at Oxford, and at Berlin, he was professor of English in the University of Texas (1897–1900), in the University of Louisville (1908–11), and at Butler University (1912–13), and then assistant professor at Purdue. His publications include, notably: *Works of Geoffrey Chaucer* (1898), edited in collaboration with A. W. Pollard, H. F. Heath, and W. S. McCormick; *An Introduction to the Study of English Poetry, being Prolegomena to a Science of English Prosody* (1902); *The Elizabethan Shakspere* (1903–), an edition with text in Elizabethan English, and fully and illuminatingly annotated; *Brief Abstract of a New English Prosody* (1914).

LID′DON, Henry Parry (1829–90). An English clergyman, generally acknowledged to have been the greatest pulpit orator of his time in the Church of England. He was born at North Stoneham, Hampshire, and educated at King's College School, London, and Christ Church, Oxford, where he took his degree in 1850. He was ordained deacon in 1852 and priest in 1853, proceeding to his first pastoral work at Wantage. In 1854 he was chosen to be the first vice principal of Bishop Wilberforce's new theological college at Cuddesdon; but the pronounced Church views which he had imbibed at Oxford from association with Pusey and Keble, his intimate friends through life, led to his resignation in 1859. He then became vice principal of St. Edmund's Hall and exercised a great and growing influence in university affairs. In 1870 he was appointed Ireland professor of exegesis, but resigned his chair in 1882 and took thereafter no active part in Oxford affairs, regarding the changes made by the Universities Commission as a repudiation of religious influence. From 1870 until his death he was a canon of St. Paul's, London, and here exercised, through the eloquence of his sermons and the power of his personality, his widest influence. He took a leading part in numerous important movements—in opposition to the Public Worship Regulation Act, in defense of the Athanasian Creed, in the foundation at Oxford of Keble College and the Pusey House, and in censure of what he considered the dangerous teachings of *Lux Mundi* (see Gore, Charles). At the time of his death he was engaged in the preparation of an elaborate life of Dr. Pusey; it was afterward edited for publication by Johnston and Wilson (London, 1893–97). He was elected Bishop of Edinburgh in 1886, but did not accept. He always remained a High-Churchman of the older school, and an opponent of liberalism in any of its forms. The most important of his published works are his Bampton Lectures *On the Divinity of Our Lord and Saviour Jesus Christ* (1866). Consult: A. B. Donaldson, *Five Great Oxford Leaders* (London, 1900); his *Life* by Russell (–1903); J. O. Johnston, *Life and Letters of H. P. Liddon* (ib., 1904); G. W. Russel, *Doctor Liddon* (Milwaukee, 1911).

LIDFORSS, lĭd′fôrs, Bengt (1868–1913). A Swedish botanist, born at Lund. He was educated at the University of Lund, became lecturer in botany there in 1897, professor at Upsala in 1910, and professor at Lund in 1911. He studied at several German universities, traveled in Italy and Bohemia, and obtained his doctorate in 1893. His special field for scientific investigations was plant physiology and microchemical anatomy. On those subjects he wrote important articles in *Acta Universitatis Lundensis* (1897, 1901, 1906); in *Vetenskabsakademiens förhandlingar* (1899, 1901–02); in *Arkiv för Botanik* (1905, 1907); in *Arskrift, Lunds Universitets* (1907, 1908). He also contributed to foreign scientific periodicals, and wrote popular articles on social, literary, and botanical subjects.

LID′GETT, John Scott (1854–). An English Wesleyan Methodist clergyman and editor, born at Lewisham. He was educated at University College, London, entered the ministry in 1876, and in 1902 was elected a member of the Legal Hundred. He was president of the National Council of Evangelical Free Churches of England and Wales in 1906 and 1907, president of the Wesleyan Methodist Conference in 1908–09, and was identified with civic interests. Together with the late W. F. Moulton he was the founder of Bermondsey Settlement in 1891, and thereafter was warden, residing at the settlement. In 1911 he became editor of the *Methodist Times* and joint editor of the *Contemporary Review.* He is author of *The Spiritual Principle of the Atonement,* his Fernley Lecture (1897; 4th ed., 1907); *The Fatherhood of God in Christian Truth and Life* (1902); *The Christian Religion: Its Meaning and Proof* (1907); *The Apostolic Ministry* (1909).

LIDNER, lēd′nĕr, Bengt (1757–93). A Swedish poet, born at Göteborg. When he entered the University of Lund (1774), he became the head of a coterie of youthful poets. Already dissipated, he had to leave the university at the end of a year and took his degree at Rostock. At Stockholm he published a collection of fables that attracted the attention of the King, Gustavus III, who sent him to Paris as secretary of the Ambassador, Creutz. While there he wrote his tragedy, *Erik XIV.* His most remarkable poems are *Grefvinnan Spastaras Död* and *Aret 1783,* and *Medea,* a tragedy. His complete works were published in 1788 and again, with a biography by Sander, in 1859 (8th ed., 1878).

LIDO, lē′dô. A range of low islands separating the lagune of Venice from the Adriatic. At the northern end lies the port of Venice, also called Lido.

LIE, lē, Jonas (1880–). An American landscape and figure painter. He was born in Norway, the nephew and namesake of the famous Norwegian writer, Jonas Lie. At 13 he came to America and studied in New York at the National Academy and the Art Students' League. He first exhibited at the academy in 1900 and was made associate in 1912. His early paintings are strongly individual and vigorously handled, yet at times inaccurate and crude. They present strong contrasts of light and shade and are imbued with a weird imagination and poetry of the North, his favorite subjects being storms, whirling winds, snow-covered wastes, or misty rivers. To this period belong "Wind Swept," "Autumn Gale," "A Winter Scene," "The Mill Race" (St. Louis Club); a few figure pieces, including "The Peasants' Dance," "The Emigrants' Wharf." Later, when his work had become more correct technically without losing any of its poetic qualities or effectiveness, he painted interpretations of familiar scenes, especially in and around New York. Such are: "From the Bridge" (1911); "Brooklyn Bridge," "A New York Canon," and "Morning on the River" (1912); "Fishing Boats at Sunrise" (Carnegie Institute, Pittsburgh). Among his latest achievements are paintings of the Panama Canal, of which there is a good example in the Metropolitan Museum of Art.

LIE, Jonas Lauritz Edemil (1833–1908). A Norwegian novelist, born at Eker, Nov. 6, 1833; died at Fleskum, July 5, 1908. He studied at Christiania, where he associated with Björnson and Ibsen, at first practiced law, and then gave himself to literature, journalism, and teaching. His first novel, *The Visionary* (1870; trans., 1894), was warmly received, and the Norwegian government accorded him a traveling stipend and soon afterward state support. He went to the Far North and to Rome, where he wrote *Sketches and Tales from Norway* (1872). His knowledge of the sea and coast life gave a peculiar flavor to *The Bark "Future"* (1872; trans., 1879) and *The Pilot and his Wife* (1874), the latter his most widely known novel. He received from the government the poet's pension and in the main lived abroad in German cities and in Paris, producing some score of good novels and two mediocre comedies. In the novels *The Slave for Life* (1883) marks a turning point. His earlier work—*Thomas Ross* (1878), *Adam Schrader* (1879), both urban; *Rutland* (1880), *Go Ahead!* (1882), both sea tales—is poetic and sympathetic. From 1883 onward—*The Family at Gilje* (1883), *A Maelstrom* (1884), *Eight Stories* (1885), *The Daughters of the Commodore* (1886), *Married Life* (1887; the last two translated into English), *Maisa Jons* (1888), *Poems* (1889), *Evil Powers* (1890), *Trolls I and II* (1891–92), *Niobe* (1893), *When the Sun Goes Down* (1895), *Dyre Rein* (1896), *Faste Forland* (1899), *When the Curtain Drops* (1901), *Ulfunger* (1903), and the dramas *Merry Wives* (1893), *Lindelin* (1897), and *Wulffie & Co.* (1901). Lie falls under the domination of the French Naturalistic school. In seeking to be more true to real life he fixes his eyes on its less pleasant aspects, but sympathy and humor never desert him when he writes of the sea and family life. Many of Lie's stories have been translated into English, German, and other languages. Lie's return to Norway in 1893 after 12 years' absence was celebrated as a national festival. His *Complete Works* (*Samlede Verker*) were published in 15 volumes (Copenhagen, 1902–04; translated into Swedish, 1908–11). Consult: A. Garborg, *Jonas Lie* (2 vols., Christiania, 1893); H. Bang, in *Tilskueren* (Copenhagen, 1908); E. Lie, *Jonas Lies Oplevelser* (Christiania, 1908).

LIE, Sophus (1842–99). A Norwegian mathematician, born at Nordfjordeid, near Bergen. He studied at Christiania and, on receiving a traveling scholarship in 1869, visited Germany, Italy, and France. In the following year he began teaching at Christiania. He received his doctor's degree in 1871, presenting a remarkable thesis, "On a Class of Geometric Transformations." From 1872 to 1886 he held the chair of mathematics (which was especially created for him) in the University of Christiania and was then called to Leipzig to succeed Klein. In 1898 he was again called to the University of Christiania and died there in January of the following year. Lie's greatest work was in the theory of differential equations and in his discovery of continuous transformation groups. His best-known works include: *Theorie der Transformationsgruppen* (3 vols., 1888–93); *Vorlesungen über Differentialgleichungen mit bekannten infinitesimalen Transformationen*, and also *Ueber continuierlichen Gruppen* (ed. by Scheffers, 1891, 1893). He was member of many scientific societies, and his mathematical discoveries gained him the much-coveted honor of the Lobatchewsky prize. For a complete list of his works, consult Friedrich Engel, "Sophus Lie," in *Bibliotheca Mathematica*, vol. i (3d series, Leipzig, 1900); for biography, Darboux, in the *Comptes Rendus de l'Académie des Sciences*, vol. cxxviii (Paris, 1899), translated in the *Bulletin of the American Mathematical Society* (New York, 1899); Engel, in the *Jahresbericht der Deutschen Mathematiker-Vereinigung*, vol. viii (Berlin, 1900). C. Störmer published a list of part of Lie's works in manuscript (in all over 20,000 folio pages) in *Christiania Videnskabsselskabs Forhandlinger* (1904).

LIEB, lēb, John William, Jr. (1860–). An American mechanical engineer, born at Newark, N. J. He graduated M.E. from Stevens Institute of Technology in 1880. Engaged by Thomas A. Edison to assist in the installation of electrical equipment at the first electrical station in the United States, the old Edison Station at Pearl Street, New York, in 1882 Lieb became the first electrician of the Edison Electric Illuminating Company of New York, a connection which he resumed in 1894 after having installed the Edison Underground System at Milan, Italy (1883), and subsequently the trolley system there. He became vice president of the New York Edison Company, president of the Electrical Testing Laboratories, and director of other corporations. In the year 1904–05 he was president of the American Institute of Electrical Engineers.

LIEBEN, lē′ben. A northeastern suburban district of the city of Prague, Austria. It is situated at the confluence of the Rokytnitzbach and the Moldau, on the right bank of the latter (Map: Austria-Hungary, D 1). Weaving, spinning, tanning, dyeing, lace making, and manufactures of machinery, chemicals, cardboard, colors, pipes, and gloves are the leading industries. Pop., 1900, 21,300; 1910, 27,034.

LIEBENSTEIN, lē′ben-stīn. A ruined castle on the Rhine, near Saint-Goar, which, with the neighboring castle of Sterrenberg, is associated with a legend of two brothers estranged through their love for their foster sister Hildegarde. The castles are hence known as the Two Brothers.

LIEBER, lē′bẽr, Ernst (1838–1902). A German politician, leader of the Clericals. He was born at Camberg, studied law and philosophy in Würzburg, Munich, Bonn, and Heidelberg, and, after taking a prominent part in the politics of Hesse-Nassau, was chosen to the Prussian House of Deputies in 1870 and to the Reichstag in 1871. He was one of the founders of the Centrum in each of these Houses and after Windhorst's death succeeded in part to its leadership. As a democratic Clerical, he opposed in 1893 the efforts of the moderate Clericals to come to an agreement with the government, but afterward he practically accepted their programme.

LIEBER, Francis (1800–72). A German-American publicist. He was born in Berlin, March 18, 1800. In 1815 Lieber enlisted in the Prussian army, fought at Ligny and Waterloo, and in the attack on Namur was severely wounded. After Napoleon's overthrow he studied in Berlin and, becoming imbued with liberal political ideas, was in 1819 accused of plotting against the government and imprisoned. The charges never came to trial, but on his discharge he was forbidden to study at the Prussian universities. In 1820 he took his degree at Jena. On the outbreak of the Greek revolution, in 1821, he went to Greece to take part in the struggle. An account of his experiences is given in his *Journal in Greece* (1823). In 1822 he found his way to Rome, where he became a tutor in the family of the historian Niebuhr. With him Lieber returned to Berlin and was rearrested on allegations of disloyalty based on the old charges. After a short imprisonment at Köpenick, enlivened by the composition of a number of poems, he was released through the efforts of his friend Niebuhr and, wearied by this constant persecution, left his native country in 1825 forever. For a short time he resided as a teacher in London, and in 1827 he embarked for the New World. His first work, the editing of the *Encyclopædia Americana,* was completed during his five years' residence in Boston (1827–32). The next two years were spent in Philadelphia, where he was interested in educational plans in connection with Girard College. In 1835 he removed to Columbia, S. C., where he occupied the position of professor of political economy in the South Carolina College for 20 years; and here he produced his most important works: *A Manual of Political Ethics* (1838); *Legal and Political Hermeneutics* (1839); *Civil Liberty and Self-Government* (1852). In his line of investigation Lieber stands second to none. Such writers and jurists as Wittermaier, Bluntschli, Laboulaye, Story, and Kent, recognized in him a kindred mind. The spirit of his work is indicated in his favorite motto, *Nullum jus sine officio, nullum officium sine jure* (No right without its duties, no duty without its rights). In 1856 Lieber was called to Columbia College, New York, to take the chair of political economy, and in 1860 accepted the chair of political science in the Columbia Law School, giving up his chair of economics. During the Civil War he served the government by preparing, at the request of the War Department, a set of "Instructions for the Government of the Armies of the United States in the Field," which is regarded as an authority on the usages of civilized warfare and forms the basis of a number of military codes to-day. It is known as "General Order No. 100" and is quoted often as authoritative. Lieber was a member of the French Institute and of numerous other learned societies in America and Europe. He died in New York, Sept. 2, 1872. Among his voluminous minor writings the following are the most noteworthy: *Reminiscences of Niebuhr; Laws of Property; Penal Laws and the Penitentiary System; Prison Discipline; The Origin and Development of the First Constituents of Civilization; Great Events Described by Great Historians.* His memoir was written by Perry, published in Boston, 1882, and a discriminating estimate of his career was published by Thayer in 1873. Lieber's *Miscellaneous Writings* were collected by Gilman and published in two octavo volumes, Philadelphia, 1881. His collection of books were sold to the University of California, and his manuscripts were deposited in Johns Hopkins University.

LIEBER, Guido Norman (1837–). An American soldier and publicist. He was born at Columbia, S. C., where his father, Francis Lieber (q.v.), was a professor in South Carolina College. He graduated at that institution in 1856 and at Harvard Law School in 1858 and at the outbreak of the Civil War was practicing law in New York City. He then obtained an appointment as a lieutenant in the regular army, was assigned to the Eleventh Infantry, was advanced to the rank of regimental adjutant, and served in McClellan's Peninsular campaign, in which he was brevetted captain for gallantry at the battle of Gaines's Mill (June 27, 1862). At the second battle of Bull Run he served as an aid on General Pope's staff. Appointed major and Judge Advocate in 1867, he was assigned to the Department of the Gulf, receiving further brevets of major for services in the Red River campaign and lieutenant colonel for general services during the war. From 1878 to 1882 he was professor of law at West Point. He became Assistant Judge-Advocate-General, with rank of colonel, in 1884, and from 1895 to 1901 was Judge-Advocate-General of the United States army, in which capacity he was one of the most valuable advisers of President McKinley during the Spanish-American War. His publications include several important treatises on the laws of war, such as *The Use of the Army in Aid of the Civil Power* (1898) and *Remarks on the Army Regulations* (1898).

LIEBER, or **LIEBLER,** Thomas. A Swiss physician and theologian, better known under the Latinized form of his name, Erastus (q.v.).

LIEBERMANN, lē′bẽr-män, Max (1847–). A German painter and etcher, one of the foremost artists of his time. He was born at Berlin, July 29, 1847, of Jewish parentage, and studied under Steffeck in Berlin, under Thumann at Weimar, and under Munkaczy in Paris from 1872. But the strongest influences in the formation of his art came from the Barbizon painters, in particular from Millet, and later from Josef Israëls, with whom he was associated during frequent sojourns in Holland. There he copied the works of Frans Hals and studied the life of the peasantry, who long furnished the themes of his finest productions. After residing from 1879 to 1884 in Munich, he settled in Berlin, where, in spite of adverse criticism, he became the recognized leader of the Secessionist movement in northern Germany. He was the first to introduce the *plein air* methods of the Barbizon school, modified later by Impressionistic principles. His art is individual, simple, and direct. Although at first labored in technique, it shows great power of rendering movement and effects of atmosphere and light. His favorite themes are from the life of the working classes, for which reason he has been frequently termed "an apostle of ugliness." In his earliest paintings, such as "Women Plucking Geese" (1872, National Gallery, Berlin), the influence of Courbet is plainly visible in the subdued color; but his development, starting with "Laborers in a Turnip Field" (1876), was constant, and in later years he worked in bright impressionistic colors. Among his Dutch themes are: "The Asylum for Old Men" (1881); "The Cobbler's Shop" (1881, Berlin); "The Flax Barn, Laren" (1887, Berlin); "The Net Menders" (1889, Hamburg); "Woman with Goats" (1890, New Pinakothek, Munich); "The Hog Market, Haarlem" (1891, Mannheim). A good example of modern genre is his "Country Tavern, Bavaria" (1893, Luxembourg, Paris). His more recent works include: "Polo Players" (1902); "Going to School, Edam" (1904, Königsberg); "Summer Evening on the Alster" (1910, Dresden); "Dutch Landscape" (1912, Munich); and many convincing portraits, such as Dr. Bode (National Gallery, Berlin); Professor Virchow, Burgomaster Petersen, of Berlin, and Gerhart Hauptmann (1913). His etchings are masterly yet simple combinations of lines and strokes, and his drawings are also highly valued. He became professor at the Berlin Academy, received gold medals at Berlin, Munich, Paris, Dresden, Antwerp, and Venice, was chosen Knight of the French Legion of Honor and of Italian, Swedish, Belgian, and other orders; member of the Prussian and Saxon academies, and honorary member of the Société Nationale des Beaux-Arts, Paris, the Société Royale, Brussels, and the Bavarian Academy.

Bibliography. Hans Rosenhagen, *Liebermann* (Bielefield, 1900); Karl Scheffler, *Max Liebermann* (Munich, 1906); Gustav Pauli, *Max Liebermann, Des Meisters Gemälde in 304 Abbildungen* (Stuttgart, 1911); H. W. Singer, *Zeichnungen von Max Liebermann* (Leipzig, 1912); Karl Graul, *Max Liebermann's Radierungen* (Berlin, n. d.); Gustav Schiefler, *Das graphische Werk von Max Liebermann* (ib., 1914).

LIEBESMAHL DER APOSTEL, lē′bes-mäl dēr ȧ-pȯs′tel, DAS (Ger., The Love Feast of the Apostles). An oratorio by Wagner (q.v.), first produced in Dresden, July, 1843; in the United States in 1859 (New York).

LIEBESVERBOT, DAS, däs lē′bes-fĕr-bōt′ (Ger., Interdiction of Love), or **DIE NOVIZE VON PALERMO**, dē nȯ-vē′tse fȯn pȧ-lĕr′mȯ. An early opera by Wagner (q.v.), first produced in Magdeburg, March 29, 1836.

LIEBHARD, lēp′härt, JOACHIM. The correct name of the German classical scholar generally known as Joachim Camerarius (q.v.).

LIEBIG, lē′bĭK, JUSTUS VON, BARON (1803–73). One of the greatest chemists of the nineteenth century. He was born at Darmstadt, Germany, the son of a dealer in dyestuffs. He early showed a strong predilection for natural science. At the age of 15 he became apprenticed to an apothecary at Heppenheim, near Darmstadt. Soon after he entered the University of Bonn, then went to Erlangen, where he took his doctor's degree in 1822. In that year he published a paper on fulminating mercury and in 1823 went to Paris, where, by further researches on the fulminates, he soon attracted the attention of Alexander von Humboldt. Humboldt introduced Liebig to Gay-Lussac, Thénard, and Dulong, and the young German chemist was hospitably received in the laboratory of Gay-Lussac. At the recommendation again of Humboldt, Liebig was made professor of chemistry at the University of Giessen (1824), where he remained for more than a quarter of a century, attracting students from all parts of Germany and from foreign countries. In 1845 the Grand Duke of Hesse raised him to the rank of Baron. In 1852 he became professor of chemistry at Munich and in 1860 president of the Academy of Sciences and curator general of the scientific collections of Bavaria. He remained in Munich until his death.

When Liebig began his career, chemistry was in its infancy. Above all, organic analysis was in an extremely undeveloped state, so that a great deal of ingenuity was required in carrying out what are now very simple analytical determinations. At the time of Liebig's death chemistry, both pure and applied, had developed beyond all expectations; and Liebig had contributed more than any one of his contemporaries to its prodigious growth. Liebig established the first laboratory where students might receive a thorough practical training in chemistry, to supplement the instruction given in the lecture room (see LABORATORY), and in Liebig's own laboratory some of the most distinguished nineteenth-century chemists were trained. Another great service was his introduction of the well-known method of organic analysis. (See CHEMISTRY, *Organic Chemistry*.) The number of carbon compounds discovered and studied by Liebig himself was very great. He analyzed many important natural alkaloids; investigated the action of chlorine on alcohol and discovered chloral and chloroform; studied the products of oxidation of alcohol and discovered aldehyde; determined the basicity of many organic acids; investigated the chemical composition of urine and the derivatives of uric acid; analyzed the juice of flesh, etc. His theory of the constitution of alcohol, ether, and chloroethane, and the celebrated research carried out jointly with Wöhler (q.v.) on the benzoyl compounds, gave a powerful impulse to the development of chemical theory. Among his contributions to chemical technology may be mentioned his method of making the cyanide of potassium, a compound extensively used in electroplating and in the manufacture of ferrocyanides. The discovery of aldehyde, mentioned above, has led to important improvements in the manufacture of mirrors and of vinegar.

The phenomena of animal and vegetable life formed one of Liebig's favorite branches of research, and he was the first to advance the theory that the activity of physical and chemical forces is the same in the organized as in the mineral world. He proved experimentally that animal heat is nothing but the energy liberated by the combustion in the organism mainly of fats and carbohydrates. Foods which serve as fuel and supply the heat of the body he termed respiratory foods. Nitrogenous substances, which—as he showed—serve to build up the tissues of the body, he termed plastic foods. He was also the first to prove that the transformation of inorganic into organic substances takes place exclusively in the organisms of plants, from which animals receive ready-formed the principal substances of their flesh and blood. Plants, on the other hand, receive their nourishment from the soil and the air, the former supplying them with the sulphates, sulphites, and phosphates of sodium, potassium, calcium, magnesium, and iron; while the atmospheric air supplies them with carbonic acid, water, ammonia, and nitric acid. It thus became clear that, in order to maintain the fertility of the soil, the saline ingredients necessary for the growth of plants must from time to time be restored to it, either in isolated form or in the form of the sewage of towns, in which they are contained in considerable quantity. The importance to agriculture of the manufacture of saline fertilizers, which has thus originated in Liebig's researches, is inestimable, and Liebig may justly be considered as one of the founders of agricultural chemistry. See CHEMISTRY, AGRICULTURAL.

Liebig's *Chemistry in its Application to Agriculture and Physiology* appeared in Brunswick and in London in 1840. The second part of this epoch-making work was published under the title *The Natural Law of Husbandry* (Brunswick, 1862; London, 1863). His *Animal Chemistry, or Chemistry in its Application to Physiology and Pathology* appeared in 1842 (Brunswick and London; 3d Ger. ed., Brunswick, 1846). An English translation of his paper on foods appeared in London in 1847, under the title *Researches on the Chemistry of Food.* The celebrated *Handbook of Organic Analysis* was published in Brunswick and in London in 1853. Liebig's publications further include: *Handwörterbuch der Chemie,* the compilation of which he began in conjunction with Poggendorff (9 vols., Brunswick, 1836–64, and a later edition); *Handbuch der organischen Chemie* (Heidelberg, 1839–43); *Theorie und Praxis in der Landwirtschaft* (Brunswick, 1856); *Naturwissenschaftliche Briefe über die moderne Landwirtschaft* (Leipzig, 1859), etc. The celebrated *Chemische Briefe* (Familiar Letters on Chemistry) first appeared in the *Augsburger Allgemeine Zeitung* (6th Ger. ed., Leipzig, 1878); it has been translated into most European languages. The list of Liebig's scientific papers comprises more than 300 titles, each paper forming a valuable contribution to organic science. In his private life Liebig was kind and hospitable, noble in thought and generous in feeling. Numberless honors were bestowed upon him. Consult: A. W. von Hofmann, *The Life-Work of Liebig in Experimental and Philosophic Chemistry* (London, 1876); W. A. Shenstone, *Justus von Liebig: His Life and Work, 1803–1873* (New York, 1895); Wilhelm Ostwald, "Justus Liebig," in *Grosse Männer* (Leipzig, 1909); Jakob Volhard, *Justus von Liebig* (2 vols., ib., 1909).

LIEBKNECHT, lēp′knĕkt, KARL (PAUL AUGUST FERDINAND) (1871–1919). A German Socialist leader, son of Wilhelm Liebknecht. He was born at Leipzig, where he studied law; and he finished in 1893 his legal studies at Berlin, where he became a practicing attorney. He was chosen selectman for the city of Berlin in 1902, became a member of the Prussian House of Deputies in 1908, and in 1912 he was elected to the Reichstag, where he was soon recognized as a leader among the Socialist deputies. In 1913 he made charges before the Reichstag that led to the revelation of the Krupp scandals, and in 1914 he was the only member of that body who voted against the $1,250,000,000 war credits. The other German Socialist deputies repudiated his action. He is author, besides *Vorbehaltszahlung und Eventualaufrechnung* (1899), of *Militarismus und Antimilitarismus* (1907; 3d ed., 1911), which was forbidden by the Imperial government to be circulated in Germany and was made the basis of a charge against Liebknecht of high treason. He was convicted in 1907 and sentenced to 18 months in prison. In March, 1915, despite his protests, he was mustered into the army and assigned to service in Alsace.

LIEBKNECHT, WILHELM (1826–1900). A German Social Democrat and agitator, born at Giessen. He studied philology and philosophy at Giessen, Berlin, and Marburg. In 1848 he took part in the revolt in Baden and was imprisoned, but escaped in May of 1849, going first to Switzerland and then to London. There he earned his living as correspondent for German newspapers and, as a member of the Communistenbund, associated with Marx and Engels. In 1862 he took advantage of the amnesty, returned to Germany, and began to write for the *Norddeutsche Allgemeine Zeitung.* But in 1865 he was banished from Prussia for Socalistic agitation. Two years later he was elected to the North German Parliament from Leipzig, and in 1868 he began to edit the *Demokratisches Wochenblatt,* in which he attacked Bismarck so bitterly that in 1872 he was imprisoned for two years, with his fellow editor Bebel (q.v.). But before he was released he had been elected to the German Reichstag (1874). Save for brief periods he kept his seat there until his death. In 1879 he was elected to the Second Chamber of the Saxon Legislature. He was editor of the Berlin *Vorwärts* from 1890 to 1900 and in 1895 was imprisoned for four months on the charge of lese majesty. He wrote: *Zur Grund- und Bodenfrage* (1876; 2d ed., 1885); *Ein Blick in die neue Welt* (1887), relating his impressions of a trip to America made in that year; *Robert Blum und seine Zeit* (2d ed., 1890); *Geschichte der französischen Revolution* (1890); *Die Emser Depesche* (7th ed., 1899); *Robert Owen* (1892); *Volksfremdwörterbuch* (13th ed., 1913). Two of his works have appeared in English, *Karl Marx: Biographical Memoirs,* translated by E. Untermann (Chicago, 1906), and *No Compromise, No Political Trading,* translated by A. Simons and M. Hitch (Chicago, 1911).

LIEBLEIN, lēb′līn, JENS DANIEL CAROLUS (1827–1911). A Norwegian Egyptologist, born at Christiania. He studied in the University of Christiania in Berlin under Brugsch and Lepsius, in Paris and Turin at the expense of the state, and later in London and Leyden. He was made professor at Christiania in 1876. As representative of Norway, he was present with Henrik Ibsen at the opening of the Suez Canal (1869), being Ismail Pasha's guest, and he traveled in Egypt again in 1887–88 and 1899–1900. His earliest publication was *Aegyptische Chronologie* (1863), which did much to systematize that branch, especially in the sequel; *Recherches sur la chronologie égyptienne d'après les listes généalogiques* (1873). His other works include: *Dictionnaire des noms hiéroglyphiques, en ordre généalogique et alphabetique* (1871), which is supplemented by *Hieroglyphisches Namenwörterbuch* (1891); *Gammelægyptisk Religion* (3 vols., 1883–85); *Egyptian Religion* (1884); *Handel und Schiffahrt auf dem rothen Meere in alten Zeiten* (1886); *Le livre égyptien: Que mon nom fleurisse* (1895), a comparison between "Papyrus Lieblein" and 20 other papyri which give the same text; and *Recherches sur l'his-*

toire et la civilisation de l'ancienne Egypte (3 vols., Leipzig, 1910–14).

LIEBLING, lēp′lĭng, Emil (1851–1914). A German-American pianist and composer, born in Pless, Silesia. He studied music and the piano with Ehrlich, Dorn, and Kullak in Berlin, and with Dachs in Vienna. In 1867 he came to the United States, where he settled as a music teacher. Upon a subsequent visit to Europe he studied under Liszt at Weimar. After 1872 he was identified with the musical life of Chicago. His compositions include piano pieces and songs, most of which have met with considerable popular favor. He died in Chicago.

LIEBMANN, lēp′män, Otto (1840–1912). A German philosopher, born at Löwenberg and educated at Leipzig and Halle. He was made professor at Strassburg (1872) and went to Jena in 1882. He retired in 1911. His writings include: *Vier Monate vor Paris*, a journal published anonymously (1871); *Kant und die Epigonen* (1865; new ed., 1912), in which, criticizing the followers of Kant, he urged a return to their master and became the first of the Neo-Kantians; *Ueber die Freiheit des Willens* (1866); *Ueber den objektiven Anblick* (1869); *Zur Analysis der Wirklichkeit* (4th ed., 1911); *Gedanken und Thatsachen* (4th ed., 1904); *Klimax der Theorieen* (1884); *Geist der Transcendentalphilosophie* (1901); *Grundriss der kritischen Metaphysik* (1901); *Immanuel Kant* (1904).

LIEBRECHT, lēb′rĕKt, Felix (1812–90). A German linguist and folklorist, born at Namslau. Educated at Breslau, Munich, and Berlin, he became professor of German at the Athénée Royal in Liége in 1849 and retired in 1867. He was the author of many valuable translations with excellent notes—e.g., of Giambattista Basile's *Pentamerone* (1846), with an introduction by Jakob Grimm; of *Barlaam und Josaphat*, by Damascenus (1857); of Dunlop's *Geschichte der Prosadichtungen* (1851); and of the *Otia Imperialia* of Gervase of Tilbury (1856). Various monographs of his were collected under the title *Zur Volkskunde* (1879).

LIEBREICH, lē′brīK, Oskar (1839–1908). A German pharmacologist. Born at Königsberg, he studied chemistry in Wiesbaden under Fresenius, and then in Berlin, and medicine in Königsberg, Tübingen, and Berlin. At the University of Berlin he became assistant in 1867, professor of therapeutics in 1868, and director of the pharmacological institute in 1872. He introduced the method of phaneroscopic illumination for the study of lupus; showed the value of cantharidin in tuberculosis, of mercuric formamide and of lanolin in syphilis, of butylchloral hydrate and of ethylene chloride as anæsthetics, and of chloral hydrate as a soporific; and in 1865 gave the name "protagon" to a proximate principle discovered in the brain and in blood corpuscles. Liebreich edited the *Therapeutische Monatshefte* (1887 et seq.) and the *Encyklopädie der Therapie* (1895–1900), and with Langgaard published a *Kompendium der Arzneiverordnung* (6th ed., 1907). Among his other works are *Ueber die Wirkung der Borsäure und des Borax* (1903); *Ueber Beziehungen der pharmakodynamischen Therapie zu anderen Wissenschaften im 19. Jahrhundert* (1904); *Zur Frage der Bor-Wirkungen* (1906).

LIECHTENSTEIN, lĭK′ten-shtīn. An independent principality, lying between Austria and Switzerland, with the exception of Monaco and San Marino the smallest independent state of Europe (Map: Switzerland, D 1). It is bounded by the Austrian Crownland of Vorarlberg on the northeast and east, and on the south and west by the Swiss cantons of Grisons and Saint-Gall respectively. The Rhine River marks the western boundary. The area is 61.4 square miles. The surface is extremely mountainous except in the western part. The country is traversed north and south by two ramifications of the Rhætian Alps and reaches in the Naafkopf an altitude of about 8440 feet. The valley of the Samina, a tributary of the Ill, separates the mountain chains in the south. The climate is generally mild and healthful, but sudden storms are frequent. Agriculture, gardening, stock raising, weaving, and the production of wine and of wooden articles are the principal industries. The principality joined the Austrian customs union by the Treaty of 1852, renewed in 1876. Its annual share of the customs receipts must not be less than $9000, but is usually about $20,000.

The principality is a constitutional monarchy, hereditary in the male line. The constitution, first adopted in 1862 and modified in 1878, 1895, and 1901, vests the legislative power in the Prince and in a Landtag of 15 members, three appointed by the Prince and 12 elected indirectly, for four years. The highest administrative authority is the Chancellery at Vienna, to which the administration at Vaduz, the capital, is subordinate, and which serves also as a court of second instance. The highest judicial authority of the principality is the Supreme Court at Innsbruck. The inhabitants are free from military duty as well as from direct taxes. The revenue and expenditure for 1912 amounted to $174,800 and $161,600 respectively. The principality has no public debt and no mint; the Austrian currency and the Austrian weights and measures and postal system are used. Liechtenstein forms a part of the Roman Catholic bishopric of Chur, Switzerland. Pop., 1906, 9650; 1911, 10,716. The inhabitants are German and nearly all Roman Catholic. The population of Vaduz is about 1400. The reigning house dates from the twelfth century. In 1719 the two principalities of Vaduz and Schellenberg were recognized by the Emperor Charles VI as the Principality of Liechtenstein. Upon the break-up of the Holy Roman Empire in 1806, it joined the Confederation of the Rhine; from 1815 to 1866 it belonged to the German Confederation; since the latter date it has been politically independent, though economically allied with Austria. The Prince of Liechtenstein resides for the most part at Vienna.

LIED, lēt (Ger., song). A German term which has no equivalent in any other language, denoting an art form established by Franz Schubert and extensively cultivated since then by composers of all ranks and nationalities. The Germans also use the term *Kunstlied* to distinguish the art form of Schubert from the *Volkslied*, or folk song, from which it is a natural development. During the latter half of the eighteenth century several German composers began to compose simple songs which were consciously modeled after the old folk songs and were called *volkstümliche Lieder*. J. A. Hiller (1728–1804) may be regarded as the father of this style. A. T. Schulz and his followers created the short symmetrical *liedform*. By means of this the composer was enabled on the one hand to preserve the unity of mood (*Stimmung*), on the other to reproduce faithfully the spirit of the individual word by means of proper declamation and harmonization. Schubert's rare genius raised this simple form at once into the domain of the highest musical art. The next step was the broadening of the strophic form into the *durchkomponierte Lied.* In the strophic form all the verses are set to the same music. The *durchkomponierte Lied* pays more attention to the individual word by allowing different musical themes for different stanzas. Schubert succeeds in preserving artistic unity by various means, repetition of some musical phrase, insistence upon some rhythmic or melodic figure in the piano part, etc. Schumann, Franz, Jensen, and Brahms developed the form further by making the piano take an important part in the thematic development, raising it above the rank of a mere accompanying instrument, which it generally is even with Schubert. Hugo Wolf, practically neglected during his lifetime, has recently come to be recognized more and more, and many competent authorities regard him not only as one of the most important figures in the history of the lied, but even as the greatest master of that form. In scrupulous adherence to the metrical accent and correct declamation of the text he surpasses all predecessors. By transferring Wagner's principle of the music drama to the lied Wolf makes the instrument the prime factor in the musical interpretation. Richard Strauss, whose songs contain some of his most divinely inspired utterances, follows very much along the lines of Wolf. Other great names, though not so important for the actual development of the lied, are those of Liszt, Tschaikowsky, and Grieg. Consult: H. Bischoff, *Das deutsche Lied* (Berlin, 1905); W. K. von Jolizza, *Das Lied und seine Geschichte* (Vienna, 1910); Herman Kretzschmar, *Geschichte des neuen deutschen Liedes* (Leipzig, 1911). See ARIA.

LIEDFORM, lēt'fōrm (Ger., song form). A musical form very much employed in instrumental music and borrowed originally from the strophic lied. It consists of three sections with two themes, A—B—A. See FORM.

LIÉGE, lē'ĕzh' (Walloon, *Lige*, Flem. *Luik*, Ger. *Lüttich*). The capital of the Belgian province of the same name and one of the most important manufacturing centres of Belgium, situated on both banks of the Meuse at its confluence with the Ourthe, in a region remarkably picturesque (Map: Belgium, D 4). Liége is the centre of the Walloon country. The hills which form the background of the city on both sides of the river are fortified by a circle of 12 detached forts, six on the right side of the river and six on the left. They were built from 4 to 6 miles from the city, at an average distance of 4 miles apart; they were constructed in concrete with casemates and with automatically disappearing heavy guns. The Meuse makes an island at Liége and divides the city into two parts—the old town on the left bank, containing the principal public buildings, and the new town on the right bank, being given up chiefly to manufacturing industries. The river is spanned here by six main bridges, of which the Pont des Arches is the most attractive. Liége has good water works, electric lighting, and excellent local transportation. The centre of the city, the Square d'Avroy, is splendidly laid out and is adorned with an equestrian statue of Charlemagne. Chief among the churches is the fine cathedral of St. Paul, founded in 968 and completed in 1528. It is built mainly in Gothic style, has a richly ornamented interior, a noteworthy pulpit, and paintings. The former cathedral, St. Lambert's, was sacked and destroyed by the French in 1794. The splendid church of St. Jacques dates from 1056 and possesses an attractive interior; the basilica of St. Barthélemy is of the twelfth century and has a remarkable bronze font of the year 1112. Among other churches may be mentioned St. Croix, a curious pile built in 970, but repeatedly restored since then; and St. Martin, founded in 962 and rebuilt in Gothic style in 1542. Perhaps the most striking building of Liége is the Palais de Justice. It was constructed as an episcopal palace in 1508–40 and was entirely restored in 1848–56. The exterior is ornamented with sculptures. The most interesting part of the building is the two interior courts surrounded by vaulted arcades and unique columns, a mixture of Gothic and Renaissance. Some of the rooms in the building are furnished with royal splendor. The building contains, besides the law court and the provincial administration offices, an interesting archæological museum. The theatre (1808–22) is modeled after the Odéon in Paris. In front of it stands a bronze statue (by Geefs, 1842) of the composer Grétry, who was born in Liége. The university buildings are also modern and scattered all over the city. The university, founded in 1817 by the Dutch government, is a state institution, has faculties of philosophy, jurisprudence, mathematics and natural sciences, medicine and technology, with an attendance of about 2861 students in 1911–12. Its natural-history museum is rich in the remains of antediluvian animals found in caverns in the district. Attached to the university are a library of 405,000 volumes, anatomical and physiological institutes, a chemical laboratory, and a zoölogical institute. The other important educational institutions of Liége are the Ecole des Mines et des Arts et Manufactures and the Ecole Electro-Technique, both affiliated with the university; a seminary for teachers, an episcopal seminary, an academy of art, a royal conservatory of music (attended by 1042 students in 1911 and famous for its teaching of stringed instruments), institutions for the blind and the deaf and dumb, and a number of scientific organizations.

The municipal museum, situated in the old cloth hall, contains a small collection of paintings, chiefly by native artists. Liége has both zoölogical and botanical gardens. From the lofty citadel, erected in 1650, there is a magnificent view. Industrially the city is noted for its extensive manufactures of weapons, which give employment to a large portion of the artisan population. A characteristic feature about this branch of production is that it is still carried on as a house industry. Naturally, however, it has begun to feel the effect of the competition of other countries where the industry is more modern in its organization. Among the larger weapon factories may be mentioned the royal gun factory and cannon foundry. The proximity of rich coal mines makes Liége an important iron and steel centre, its products including different tools and instruments, heavy machinery, needles, nails, etc. Watches, gold and silver articles, mirrors, cloth, leather, paper, oil, and chicory are also among the manufactures, and Liége has large zinc foundries. Its commerce is of great extent; there is considerable navigation in the port. Liége is the seat of a bishop and a United States consul. Pop. (commune), 1890, 147,660; 1900, 157,760; 1910, 167,521; 1913, 170,634, mostly Roman Catholics. The population of the city and the suburbs (Angleur, Bressoux, Grivegnée, Herstal, and Ougrée) was 190,744 in 1890, 214,838 in 1900, and 242,357 in 1910.

The city is believed to have had its origin in a Roman colony. It became the residence of a bishop at the beginning of the eighth century, and its history may be epitomized as a continual struggle between its citizens and the bishops, who were princes of the Holy Roman Empire. The latter frequently employed foreign armies to crush the rebellious spirit of the townspeople. In 1468 it was taken by Charles the Bold of Burgundy and later by Maximilian I. During the seventeenth century it was seized repeatedly by the French, and it fell before Marlborough in 1702. In 1801 it was ceded to France by the Treaty of Lunéville. In 1815 it was annexed to the United Netherlands, and in 1830 it was incorporated with Belgium. Liége was the scene of the first real battle of the European War which began in 1914. After a futile attempt to take it by assault the Germans were obliged to intrench and bring up heavy siege artillery. Although the invaders early entered the city itself, it was only after a two weeks' bombardment that the forts, which were not destroyed by the retreating Belgians, were finally captured. See WAR IN EUROPE.

Consult: Henry Sage, *Les institutions politiques du pays de Liége au XVIIIe siècle, leur décadence et leur dernier état* (Paris, 1908), containing a bibliography; Godefroid Kurth, *La cité de Liége au moyen-âge* (3 vols., Brussels, 1909–10); for the siege of 1914, Paul Hamelius, *The Siege of Liége: A Personal Narrative* (London, 1914), and J. M. Kennedy, "The Campaign around Liége," in *Daily Chronicle War Books*, vol. iv (ib., 1914).

LIEGNITZ, lēᴋ′nĭts. A town in the Province of Silesia, Prussia, capital of the former Principality of Liegnitz, near the confluence of the Schwarzwasser and the Katzbach, 40 miles by rail west-northwest of Breslau (Map: Germany, F 3). The city proper is surrounded by promenades and has many fine suburbs. The principal churches are St. John's, containing monuments of the dukes of Liegnitz and Brieg, of the house of Piast, and SS. Peter and Paul, dating from the fourteenth century and recently restored. The royal castle, destroyed by fire in 1835, has been restored and is used as a government building. Liegnitz has a new city hall, a municipal Gymnasium founded in 1309, an academy for the children of noblemen, an agricultural school, a seminary for female teachers, a museum of antiquities, and a theatre. The manufactures include cloth, machinery, pianos, shoes, tobacco, oil, woolens, wagons, glazed brick, cutlery, gloves, lumber, lamps, whips, and cabinetwork. Vegetables are extensively cultivated. Liegnitz is first mentioned in 1004 and was after 1164 the residence of the dukes of Liegnitz. Near Liegnitz, on the battlefield known as the Wahlstatt, the Silesians, Poles, and Teutonic Knights fought a bloody battle with the Mongols in 1241. As a fortified town, it figured prominently in many wars. It has been in possession of Prussia since 1742. Here in 1760 Frederick the Great defeated the Austrians under Laudon. Pop., 1900, 54,839; 1910, 66,620.

LIEN, lē′*en* *or* lēn (Fr. *lien*, bond, from Lat. *ligamen*, band, from *ligare*, to bind). In law, a security or hold over goods or land, and the right to retain or take the same for a debt which is due. Liens exist (1) at common law, (2) in equity, (3) in admiralty, and (4) by statute; and each of these differs from the others in character and in its effect upon the property. 1. Liens upon chattels were recognized and enforced at common law in favor of innkeepers, common carriers, attorneys, warehousemen, factors, and any one who had performed work upon a chattel in his possession at the owner's request—all of which attached by implication of law without any express agreement. A lien might also be created by a contract or agreement between debtor and creditor by which the debtor deposited personal property with the creditor as security for his debt (see PLEDGE), or in a particular business or trade by a usage so extensive and well established that the courts of law will recognize it. In general, a lien cannot be acquired against the owner of a chattel when possession is given to the would-be lienor by one wrongfully having possession of the chattel. Innkeepers may, however, acquire a lien on stolen goods brought to them by the thief and it has been held in England that a common carrier has a lien for freight on goods shipped by one not the owner. Possession of the property by the lienor is essential to a common-law lien; for as soon as the goods are voluntarily parted with by him the lien is gone. The lienor's only right at common law was to retain possession of the property until his claim was paid. He could not make use of it for his own purposes or sell or otherwise dispose of it without forfeiting his lien and entitling the owner to recover the value of the property in an action of trover. Equity, however, early took jurisdiction to relieve the lienor by allowing him to foreclose his lien and collect the amount due from the proceeds of the judicial sale of the chattels. In many states the lienor now has statutory authority to sell chattels on which he has a lien (usually only on notice to the owner) and apply the proceeds to the payment of the debt.

A common-law lien may be either general or specific. It is *general* when it may be enforced for a general balance due from the owner to the lienor and is not confined to the amount due upon or on account of the specific article over which it exists. A *specific* lien is one over specific goods for a debt contracted in respect to them alone, as for the price of them or for some labor or services expended upon them. Thus, a vendor of goods has a special lien upon them while they remain in his possession with the price due and unpaid, after the title to them has passed to the vendee. A miller has a special lien on the flour he has ground, an artisan on the article he has repaired, etc. Warehousemen and carriers have what has been called a general-special lien—i.e., if an owner place a large quantity of goods in their custody at one time, they may retain any portion of them in their possession for their charges upon the entire quantity, but they have no lien for charges upon goods placed with them at other times. Common carriers also have a lien for charges paid by them to connecting carriers upon the goods upon which a lien is claimed as well as for their own charges. The right of stoppage in transitu—i.e., the right of a vendor to retake goods in transit before delivery to vendee in case of the insolvency of the vendee, as security for the purchase price—although originally equitable in character, is now recognized and enforced as a lien by courts of law.

2. Equitable liens, or those enforced by a court of equity only, are in the nature of constructive trusts (see Trust); i.e., the owner of property is compelled to apply his property in certain cases specifically to the payment of his debt. Equitable liens, unlike common-law liens, may be either upon real or personal property and do not depend on the possession of the lienor. Equitable, like common-law, liens may arise by implication of law. Thus, the vendor of real estate who has given a deed of the property to the vendee has a lien to secure the payment of the purchase price; and the vendee who has paid the purchase price without securing a deed has a lien upon the land to secure the money so paid. Of like character are the reciprocal liens of partners upon the partnership property, and the lien of *lis pendens* (q.v.). Equitable liens arise more frequently from contract or agreement. An agreement for a lien or security which falls short of a legal mortgage or pledge will be enforced in equity as between the parties and against third parties who are not innocent purchasers for value. The rights of third parties with reference to equitable liens are now variously affected by statutes providing for the recording of liens and mortgages. See Recording Acts.

3. Liens in admiralty are similar to those in equity. Like the latter, they do not depend upon possession. They are enforced by means of a libel filed in the admiralty court upon the vessel or property upon which the lien is claimed. See Admiralty Law; Maritime Law.

4. Important liens also exist by virtue of statutes. One of the most beneficent of these is the lien given to mechanics and materialmen for work and material furnished for the erection of buildings, another is the judgment lien upon real property, and still another the lien given to boarding-house keepers on the goods of their boarders for the amount of board furnished and unpaid for. Most statutory liens are acquired by filing a notice of the lien in the appropriate office for records, usually the office of the county clerk; and they are enforced by judicial proceedings corresponding to foreclosure of mortgage.

Bibliography. Kneeland, *Mechanics' Liens* (3d ed., New York, 1893); H. T. Lummus, *Law of Liens* (Boston, 1904); F. W. Atkinson, *Law and Practice Relating to Solicitors' Liens* (Toronto, 1905); Elkus and Glenn, *Treatise on Secret Liens and Reputed Ownership* (New York, 1910); W. Ashburner, *Concise Treatise on Mortgages, Pledges, and Liens* (2d ed., Boston, 1911); E. Frank, *Title to Real and Household Estates and Liens* (Baltimore, 1912); R. L. Henry, Jr., *Law of Liens and Pledges* (Chicago, 1914); L. A. Jones, *Treatise on the Law of Liens* (3d ed., Indianapolis, 1914). See Carrier, Common; Inn; Innkeeper; Mortgage; Pledge; and consult authorities there mentioned.

LIENHARD, lēn'härt, Friedrich (Fritz) (1865–). A German poet and journalist. He was born in Rothbach in Alsace, the eldest son of a village schoolmaster, studied philology and theology at Strassburg and Berlin, spent two years as a private tutor, and then traveled in Norway, Scotland, France, and Italy. Upon his return he settled in Berlin and did editorial work for the *Deutsche Zeitung* and also for the *XX. Jahrhundert*. In 1903 he gave up journalism to devote himself entirely to independent literary work. He was one of the first disciples of the movement known as the *Heimattheorie* in art, a theory of home art as opposed to the exotic, an old idea revived in new form by Julius Langbehn's strange and at that time much discussed book *Rembrandt als Erzieher: Von einem Deutschen* (1890; 42 eds. in three years). Lienhard's lyrics, perhaps his best work, appearing as *Lieder eines Elsässers* (1895; 2d ed., 1897) and *Gesammelte Gedichte* (1902; 2d ed., 1906), have a healthy, genuine, thoroughly German tone, but fail to rise to great heights. His dramas, which for the most part are efforts to revive in form and matter old German themes (somewhat in the manner of Richard Wagner), have earnestness and dignity but little genuine life. The best are: *König Arthur* (1899); *Heinrich von Ofterdingen* (1903; 3d ed., 1911); *Wieland der Schmied* (1905; 2d ed., 1910). Of his prose works the most important is the series of six volumes of essays, entitled *Wege nach Weimar* (1904 et seq.). These appeared as a monthly publication. Among his later works may be mentioned: *Oberlin* (1910; 13th ed., 1912), a novel; *Lichtland* (1912), poems; *Der Spielmann* (1913). Consult Friedrich Kummer, in *Deutsche Literaturgeschichte des 19. Jahrhunderts* (Dresden, 1909).

LIENHARD UND GERTRUD, lēn'härt ụnt gĕr'trōōt, Ein Buch für das Volk. An educational novel, published by Johann Heinrich Pestalozzi (q.v.) in 1781, embodying his main educational ideas.

LIER, lēr, Adolf (1826–82). A German painter, born at Herrnhut, Saxony. He studied architecture in Dresden, then painting at Basel under Süffert and at Munich under Zimmermann. Afterward he was with Jules Dupré in Paris for a year and at Isle-Adam. In 1865 he went to London. Upon his return he taught at Munich from 1869 to 1873 and became the head of a school of landscape painters which, like the Barbizon school, expressed the moods of nature rather than her physical aspects and has had considerable influence on German art. His subjects are usually storms or evening effects, painted in the neighborhood of Munich or in France, with much simplicity and intimate charm. Among the best known are: "The Oise by Moonlight" (1867, Dresden Gallery); "Evening on the Isar" (1877, National Gallery, Berlin); "Harvest in Upper Bavaria" (Leipzig Museum); and "Scottish Coast Landscape" (Stuttgart Museum).

LIER, Jacques van (1875–). A celebrated Dutch cellist, born at The Hague. He began his studies in his native city under Hartog and Giese and later went to Eberle in Rotterdam. In 1891 he became first cellist of the Palace Orchestra of Amsterdam. The following year he took up his residence in Basel, whence he made several extensive concert tours through Europe. From 1897 to 1899 he was a member of the Berlin Philharmonic Orchestra and in the latter year joined the faculty of the Klindworth-Scharwenka Conservatory. Together with Bos and Van Veen he formed the Dutch Trio, and with Van Veen, Feltzer, and Ruinen the Dutch String Quartet, both of which organizations enjoy a European reputation. He is the author of a number of instructive works for the cello.

LIERNE (lyârn) **RIB** (Fr., perhaps for *lienne*, warp thread uncrossed by the woof, from *lier*, from Lat. *ligare*, to bind). A minor rib in Gothic vaulting. The name is properly applied to the short ribs which connect the main ribs sprung from the vaulting shaft with each other and with the ridge rib, forming more or less elaborate patterns. The vaulting in which they are used is called lierne vaulting, which in England preceded fan vaulting (q.v.); in France it occurs but rarely, and it is found in modified form in Spain and Germany.

LIERRE, lyâr (Flem. *Lier*). A town of Belgium, in the Province of Antwerp, 9 miles southeast of the city of Antwerp, at the confluence of the Great and Little Nethe (Map: Belgium, C 3). Its church of St. Gommarius, a fine late Gothic building, finished in 1557, has three fine windows, donated by the Archduke Maximilian, and a number of excellent paintings, including two by Rubens. Lierre manufactures silk, lace, sugar, shoes, and beer. Pop., 1900, 22,654; 1905, 24,611; 1910, 25,869. Lierre was bombarded several times by the Germans in the severe fighting which preceded the fall of Antwerp during the European War which began in 1914. See WAR IN EUROPE.

LIES, FIELD OF. See FIELD OF LIES.

LIESIN, lē′zĭn, ABRAHAM (1872–). The pen name of Abraham Walt, a Jewish-American poet and journalist. Born in Minsk, Russia, of orthodox parents, he received the traditional Jewish education. His heretical views, however, led to his expulsion from the Volozin Talmudical College, and he went to Vilna, where he soon plunged into the revolutionary movement. In 1896, dissatisfied with the existing revolutionary organization, he formed a new one (called simply the Opposition), which already had a strong following when its founder, who had long been hounded by the secret police, was obliged to leave Russia. He came to New York in 1897 and resumed his Socialist-revolutionary activity. His articles appeared in every prominent Jewish-Socialist organ and played a great part in the development of Jewish-American Socialism. In 1914 he became editor of *Die Zuknuft*, a Yiddish-Socialist monthly. His verse, the first of which appeared in 1893, includes lyrics and miscellaneous poems. The former show the unmistakable influence of Heine and rank very high in contemporary Yiddish poetry, while the latter include some of the choicest romantic ballads in the Jewish language. Less impressive, though numerous, are his libertarian poems, specimens of which may be found in a miscellaneous volume of verse, culled from the work of various Yiddish contemporary poets, entitled *Freiheit: Revolutionäre Lieder* (Geneva, 1905).

LIESKOV, lyĕ-skôf′, NIKOLAI SEMIONOVITCH (1831–95). A Russian novelist, known at one time under the pseudonym of Stebnitsky. He was born in the Government of Orel, and though early thrown upon his own resources, becoming a court clerk at 17, he managed to round out his education. He not only read much, but, as secretary of a circuit court, traveled considerably. It was during these years of wandering that he gathered an almost inexhaustible wealth of literary material. His career as a writer began with a few striking sketches in 1860. Having incurred the bitter censure of radicals by his reactionary attitude, he went abroad before publishing his first novel, *No Way Out* (1864). Its uncomplimentary pictures of Nihilists and its general disparagement of contemporary Nihilism further incensed the radicals. Yet the author's second work, *To the Knife* (published serially in 1870–71), proved even more objectionable to the social idealists. Afterward, however, his work gradually lost its polemical character and became more popular. *The Priests* (1872) clearly marked this turning point. With his next collection of stories, *The Sanctified* (1881), his name and fame rapidly spread. He even received an important appointment in the Ministry of Public Instruction, which, however, he relinquished in 1883. Then, coming under the influence of Tolstoy's moral philosophy, he studied the history of Christianity and took to writing religious legends in the style of Flaubert.

Lieskov's inventive fertility is amazing; his shortest stories (of five or six pages) could easily be expanded into long novels. His literary form is equally compressed. Finally, his art in conveying local color and his extraordinary mastery of language place him among the great Russian novelists. The latest complete edition of his works (13 vols., St. Petersburg, 1902–03) contains a good biographical and critical study of the author.

LIEUTENANT, lů-tĕn′ant, *or, esp. Brit.*, lĕf-tĕn′ant (OF., Fr. *lieutenant*, It. *luogotenente*, from ML. *locum tenens*, one who holds another's place, from Lat. *locus*, place, and *tenere*, to hold). A subaltern military rank. In the United States a military cadet on appointment to the army receives the grade of second lieutenant, becoming first lieutenant in the order of seniority as vacancies occur. In the British service second lieutenants are appointed lieutenants in their regiments or corps as vacancies occur. The number of lieutenants per company varies in many European armies, but the general average is two or three to each captain or company. The duties of a lieutenant the world over are to assist the captain under whom he serves and to supervise the routine details connected with the interior economy of his corps or regiment, as officer of the guard, officer of the day, etc. On active service he would usually have command of examining guards, patrols, and pickets. In the United States army it frequently happens that, owing to the scattered posts and detachments, the first lieutenant is virtually the company commander and exercises all the functions and performs all the duties incident to the rank of captain. See PAY AND ALLOWANCES.

Lieutenant, Naval. A lieutenant in the navy is an officer junior in rank to a lieutenant commander and senior to an ensign. Lieutenants are of two grades, senior and junior. The senior ranks with a captain in the army or marine corps and the junior with a first lieutenant in either of these services. Lieutenants perform duty as watch officers, senior engineers, first lieutenants, navigators, executive officers, ordnance officers, or division officers depending upon the size of the vessel and other circumstances. The pay of lieutenants of the senior grade is $2400 and of the junior grade $2000 per annum; to these amounts there is an addition of 10 per cent for each five years of service. The number of lieutenants on the active list of the navy on Jan. 1, 1915, were, senior grade, 351; junior grade, 381.

Lieutenant, First, of a man-of-war. Formerly the officer of the line or executive branch next in rank to the captain was a lieutenant, and to distinguish him from the others of the same rank he was called the first lieutenant, and he performed the duties of executive officer (q.v.). During the Civil War the grade of lieutenant commander was instituted. For many years afterward an officer assigned to duty as executive officer continued to be referred to as the first lieutenant, even if his actual rank was that of lieutenant commander. The arduous duties of the executive officer increased as the size of ships was augmented, until it was realized that in battleships and armored cruisers of modern type the work was too great for one man. It was therefore divided, and that portion concerning the care and maintenance of the *matériel* of the ship assigned to an officer who is designated the *first lieutenant*. He is usually next in rank to the executive, though this is not the invariable practice; but he is always senior to all divisional officers. In rank he may be a lieutenant or a lieutenant commander. See Rank and Command.

LIEUTENANT COLONEL. The intermediate rank between major and colonel. In the United States army his duties are to assist the colonel in command of the regiment. In the United States army a lieutenant colonel may command a battalion when the major is absent. In European armies the lieutenant colonel is often the actual commander of the regiment, the title of colonel being an honorary one conferred upon royal and other important personages. See Pay and Allowances.

LIEUTENANT COMMANDER. An officer of the United States navy above the rank of lieutenant and below that of commander. The grade was established upon the reorganization of the navy in 1862. Lieutenant commanders rank with majors in the army and have the same pay. A lieutenant commander may command a ship of the fourth rate or a ship not rated, or serve as executive officer, first lieutenant, navigator, or senior engineer officer in a ship commanded by an officer of a superior grade. On shore he performs such duties as may be assigned him. The number on the active list of the navy in 1915 was 204.

LIEUTENANT GENERAL (United States army). According to the Act of May 28, 1798, the President is authorized to appoint, by consent of the Senate, a commander of the army. It is provided that the commander of the army, as well as other officers appointed under the act, may be discharged whenever in the opinion of the President the public safety justifies it. Originally the commander was commissioned as lieutenant general, but on March 3, 1799, it was enacted that this rank be abolished, and the title of general substituted. On Feb. 15, 1855, the grade of lieutenant general was revived for Major General Scott for his services in the Mexican War. He retired in 1861. In February, 1864, an Act of Congress was passed directing that the grade of lieutenant general be again revived. On March 2, 1864, Maj. Gen. U. S. Grant received the appointment, followed on July 25, 1866, by Maj. Gen. W. T. Sherman, the grade of general having been revived for Lieutenant General Grant. When the latter was elected President of the United States, Lieutenant General Sherman was made general, Maj. Gen. P. H. Sheridan becoming lieutenant general. An Act of Congress, 1870, abolished the office of lieutenant general and general as soon as vacated. The grade was revived for Major General Schofield from Feb. 5 to Sept. 29, 1895, and again for Major General Miles in 1900. Since the retirement of Lieutenant General Miles as commanding general of the army, the office of lieutenant general and chief of staff has been held by Generals Young, Bates, and Chaffee. The grade expired with the death of Lieut. Gen. Arthur MacArthur. A field army, composed of two or more divisions, is the appropriate command of a lieutenant general. In the United States army the grade does not exist in time of peace, but may be revived in time of war.

LIEVELY. See Godhavn.

LIEVEN, lē′vĕn, Dorothea, Princess of (1784–1857). A woman once prominent in the diplomatic circles of Europe, the daughter of Christoph von Benkendorf, an Esthonian of the middle class. She was born at Riga and received a brilliant education. She was married in 1800 to Prince Christoph Lieven, Russian Ambassador to Prussia, displayed remarkable diplomatic aptitude, and soon enjoyed a continental reputation. On her husband's appointment to the Court of St. James's in 1812, she speedily established herself in a firm position in the political and fashionable society of London. In 1837, upon the death of her husband, she removed to Paris. Here her salon was the centre of schemes and intrigue involving the interests of half of Europe. Consult L. G. Robinson, *Letters of Dorothea during her Residence in London, 1812–1837* (London, 1902), and Sir Spenser Walpole, *Essays, Political and Biographical* (New York. 1908).

LIEVENS, lē′vĕns, **LIVENS,** or **LIEVENSZ,** Jan (1607–74). A Dutch historical and portrait painter and etcher, born at Leyden. He studied at an early age under Joris van Schooten, and later with Peter Lastman at Amsterdam. His work became known in England through the Prince of Orange, and Charles I invited him to visit his court. After a stay of three years in England he settled at Antwerp, where he entered the painters' guild in 1634, and in 1643 he removed to Amsterdam. His early work shows strong resemblance to that of his great contemporary Rembrandt, although inferior in draftsmanship, color, and invention. Many works attributed to the greater master, like the "Presentation in the Temple" in The Hague Museum, are supposed by some critics to be the joint work of both, while others, such as "St. Paul in Meditation" (Museum of Art History, Vienna), are entirely by the hand of Lievens. His work has also been confounded with that of Van Dyck, who strongly influenced his later style. Lievens helped to introduce Caravaggio's influence into Dutch monumental art. Among his authentic paintings are: "Abraham Embracing Isaac" (1642) (Brunswick Museum); "Samson and Delilah" (Amsterdam Museum); portrait of Sir Robert Ker (Newbattle Abbey, Edinburgh). As an etcher, he takes a high rank; his plates are somewhat in the manner of Rembrandt.

LIEZEN-MAYER, lē′tsen-mī′ĕr, Alexander von (1839–98). An Hungarian painter and illustrator. He was born at Raab and studied at Vienna and Munich, where he became the pupil of Piloty in 1862. He first attracted attention with two episodes from the history of his native land, "Queens Mary and Elizabeth of Hungary at the Tomb of Louis the Great" and "Coronation of Charles of Durazzo." Three years afterward he was commissioned by the academy to paint "Canonization of Elizabeth of

Thuringia"; and signal success came to him in 1867 with the completion of his "Maria Theresa Nursing a Poor Woman's Child." Among his best works at this time were his portraits, which include those of the Bishop of Raab, Alexander Wagner, and Emperor Francis Joseph, painted at Vienna in 1870. After his return to Munich he painted, among other historical compositions, "Elizabeth Signing the Death Warrant of Mary Stuart" (1873), now in the Museum at Cologne; "St. Elizabeth of Hungary Performing an Act of Charity" (Budapest Museum); and "Matthias Hunyadi Receives the News of his Elevation to the Throne" (1897)—his last painting, which received the great gold medal at the Budapest Millennium Exhibition. Liezen-Mayer was one of the most talented followers of Piloty (q.v.), and to those traditions he remained faithful throughout his career. That he was a draftsman of the first rank is proved by his illustrations for Goethe's *Faust* (50 cartoons) and Schiller's *Lay of the Bell* (32), done between 1874 and 1880. He was appointed director of the School of Art at Stuttgart in 1880, but returned to Munich in 1883 and in the same year was made professor at the academy.

LIFE, MEAN DURATION OF. The average length of life enjoyed by a given number of persons of the same age. Of 100,000 persons aged 10 years, 749 die the first year. Of the remainder, 746 die in the next year. Following up the deaths each year until all die, it is ascertained that the average age to which a number of the group of 100,000 survives is 48.7 years. This is called, in other words, one's "expectation of life." Though many die sooner, a boy of 10 years may expect to live to be 48.7 years old. If he survives to that age, his expectation at 59 years is that he will live 14.7 years longer, as that is the average age reached by the 59,385 survivors of the original group of 100,000 who attain the age of 59.

Following is an Expectation Table constructed for the use of insurance companies from the American Table of Mortality, which has been adopted by the State of New York as the standard for valuation of insurance policies:

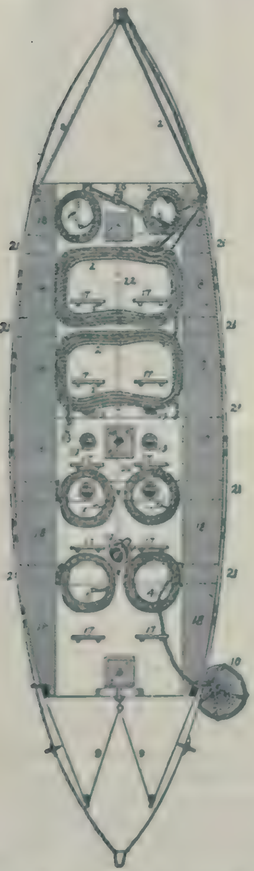
COMPLETED AGE	Number surviving at each age	Deaths in each year
10	100,000	749
11	99,251	746
12	98,505	743
13	97,762	740
14	97,022	737
15	96,285	735
16	95,550	732
17	94,818	729
18	94,089	727
19	93,362	725
20	92,637	723
21	91,914	722
22	91,192	721
23	90,471	720
24	89,751	719
25	89,032	718
26	88,314	718
27	87,596	718
28	86,878	718
29	86,160	719
30	85,441	720
31	84,721	721
32	84,000	723
33	83,277	726
34	82,551	729
35	81,822	732
36	81,090	737
37	80,353	742
38	79,611	749
39	78,862	756
40	78,106	765
41	77,341	774
42	76,567	785
43	75,782	797
44	74,985	812
45	74,174	828
46	73,345	848
47	72,497	870
48	71,627	896
49	70,731	927
50	69,804	962
51	68,842	1,001
52	67,841	1,044
53	66,797	1,091
54	65,706	1,143
55	64,563	1,199
56	63,364	1,260
57	62,104	1,325
58	60,779	1,394
59	59,385	1,468
60	57,917	1,546
61	56,371	1,628
62	54,743	1,713
63	53,030	1,800
64	51,230	1,889
65	49,341	1,980
66	47,361	2,070
67	45,291	2,158
68	43,133	2,243
69	40,890	2,321
70	38,569	2,391
71	36,178	2,448
72	33,730	2,487
73	31,243	2,505
74	28,738	2,501
75	26,237	2,476
76	23,761	2,431
77	21,330	2,369
78	18,961	2,291
79	16,679	2,196
80	14,474	2,091
81	12,383	1,964
82	10,419	1,816
83	8,603	1,648
84	6,955	1,470
85	5,485	1,292
86	4,193	1,114
87	3,079	933
88	2,146	744
89	1,402	555
90	847	385
91	462	246
92	216	137
93	79	58
94	21	18
95	3	3

According to the Actuaries' or Combined Experience Table of Mortality, as given by Greene, the number of deaths in each year is somewhat lower. At 10 years, e.g., of 100,000 individuals the number dying is 676, with an expectation of 48.7 years. At 20 years the number of deaths would be 680, with a life expectation of 41.49 years. See Brandreth Symonds, *Life Insurance Examinations* (New York, 1905); C. L. Greene, *The Medical Examination for Life Insurance* (Philadelphia, 1905).

LIFE AND ADVENT UNION. See ADVENTISTS.

LIFEBOAT. A boat specially constructed for saving persons from wrecked or imperiled vessels, in storms or heavy seas, when the use of an ordinary open boat would be impossible or extremely dangerous. There have been countless contrivances for this purpose, all varying in their types; but unless a boat is provided with some distinctive properties, such as those of self-bailing or self-righting, or both combined, it is not considered a lifeboat in the strict meaning of the term. The conventional open boat, with or without air chambers, which is used in broken water along the seashore for rescuing life, is known as a surfboat. The name "surfboat" is generally applied to boats which are designed to be launched from the beach without the aid of launchways, etc. Surfboats are principally used by the coast fishermen for passing daily out and in through the surf in pursuit of their vocation.

The many so-called improvements that have been devised at one time or another for lifeboats, which have modified or departed from first principles, have generally proved of no practical value, and there would be little advantage in considering them here. Neither would it serve any profitable purpose to go further back than the time of the origin of the present English model, even if that could be done with any degree of certainty. In 1785 Lionel Lukin, a coach maker of an inland town near London, put afloat on the Thames a Norway yawl, which he had fitted with water-tight compartments, a heavy iron keel, and other essentials in buoyancy and stability, which are the cardinal and requisite features of the lifeboat of to-day. Lukin did not succeed in bringing his invention, which had many defects, into particular notice up to the time of his death, which occurred in 1834. An expert boat builder of South Shields, Henry Greathead, however, put Lukin's device into practical use as early as 1790, when he produced a boat embodying the elements of the original, but with a curved keel and the substitution of cork for side air chambers. This boat had no means of freeing itself of water or of self-righting in case of being capsized. James Beeching, of Great Yarmouth, was really the first person to project a self-righting lifeboat, which he did in 1851, the design subsequently being bettered by James Peake, who added to it the self-bailing quality. This boat has since been much improved by study and experiment.

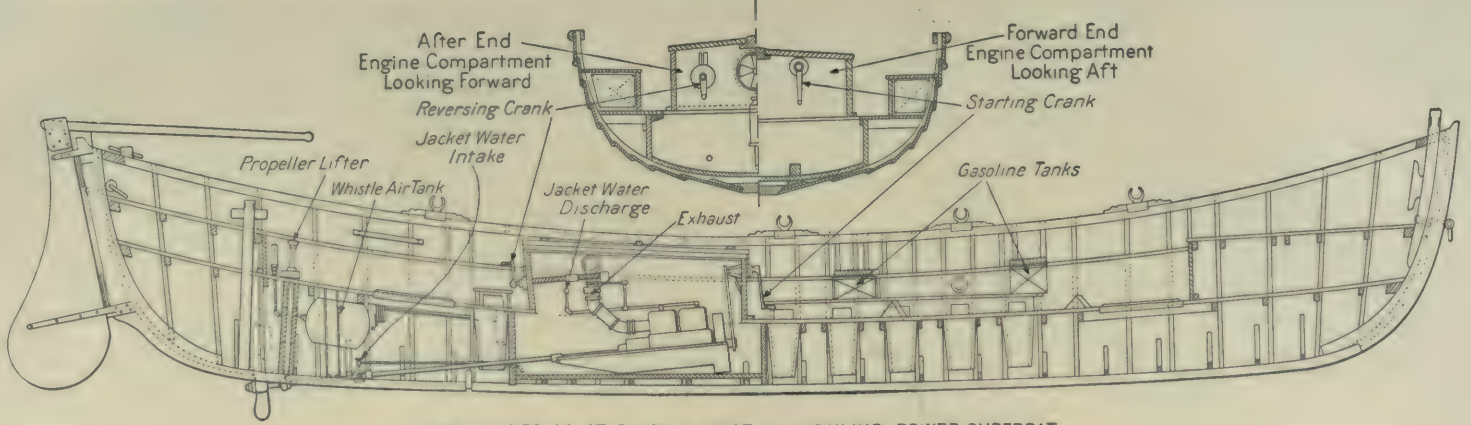


DECK PLAN OF A SELF-RIGHTING LIFEBOAT, SHOWING THE MANNER IN WHICH THE GEAR IS STOWED.

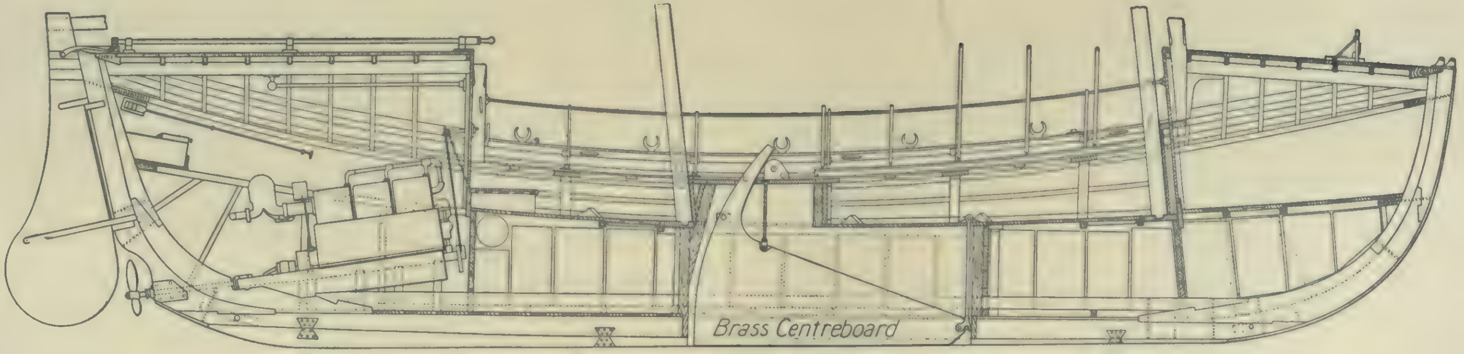
List of articles shown: 1, anchor; 2, cable; 3, bow heaving line or grapnel rope and grapnel; 4, drogue rope; 5, stern heaving line; 6 and 7, veering lines; 8, jib outhaul or tack; 9, mizzen sheets; 10, drogue; 11, life buoy; 12, loaded cane, heaving line and tub; 13, tailed block; 14, pump-well hatch; 15 and 16, deck ventilating hatches; 17, footboards for rowers; 18, side air cases; 19, relieving tubes and valves; 20, Samson post; 21, thwarts; 22, central batten, to which the masts and boat hooks are lashed.

The chief requirement of the English lifeboat is to counteract, as far as practicable, the tendency of the boat to swamp when it ships a sea and to remain bottom up when capsized. It therefore must possess extra buoyancy, stability, self-bailing and self-righting qualities.

Thirty-four-foot lifeboats patterned after the English model were formerly used in the United States Life-Saving Service at stations on the Great Lakes and at a few points on the ocean coasts where they could be launched. In the process of development of an efficient power lifeboat, 25-horse-power gasoline engines were installed in the 34-foot boats, and these converted boats have been in turn superseded by larger and better power lifeboats. The power lifeboat in the United States Life-Saving Service is 36 feet long, has an extreme width of 8 feet, 7½ inches, and develops a uniform speed of about 9 miles an hour. For motive power the boat is provided with a gasoline engine, sails, and oars for use in case of necessity. The motor is a 6-cylinder, 4-cycle, 35–40-horse-power automarine engine. It is placed in the after-end air chamber of the boat, and on the outside of the bulkhead, in recesses, are starting crank shaft, reverse lever, oil cups, etc. The boat is electrically lighted and is provided with a knockdown guard rail and a folding spray hood. None of the characteristic features of a lifeboat, such as self-righting and self-bailing, is in any way impaired by the installation of the engine and its accessories. In the event of a capsize the engine stops automatically and, owing to its inclosure in the water-tight compartment, suffers no damage or derangement. This type of boat weighs about 8½ tons and is launched from launching ways or by the use of hoisting apparatus. The frames of the boat are of white oak, and the outside planking is of Honduras mahogany, laid diagonally. To render the craft buoyant and insubmergible, a large air-tight compartment is built at each end (the engine is in the stern compartment), and air cases are placed under the deck and along the sides of the boat abovedeck and beneath the thwarts. The self-bailing of the lifeboat is accomplished by means of 10 draining tubes, 7 inches in diameter, extending from the deck, above the water level, down through the bottom of the boat, the top of each tube being fitted with a self-acting valve, which opens downward when there is pressure from above and permits the water to flow out, but prevents it from entering the boat from below. Should the boat capsize and right itself filled with water, or be boarded by heavy seas, the water passes through the valves into the relieving tubes and escapes. A heavy gun-metal keel is secured to the wooden keel of the boat, and this, in conjunction with the air chambers, effects the self-righting property. The craft, when bottom up, floats unsteadily on the bow and stern compartments, while the keel, being carried above the centre of gravity, falls on one side or the other and drags the boat back to its natural, upright position, the water that has been shipped in the process passing out through the tubes. The lifeboat has five thwarts, which can accommodate 10 oarsmen, double banked, is fitted with a centreboard, and provided with movable masts. Suspended below the gunwales along each side of the boat are festooned life lines, to which persons in the water may cling until they can be helped into the boat. The equipments, which are very complete, are carefully stowed in the boat always ready for im-

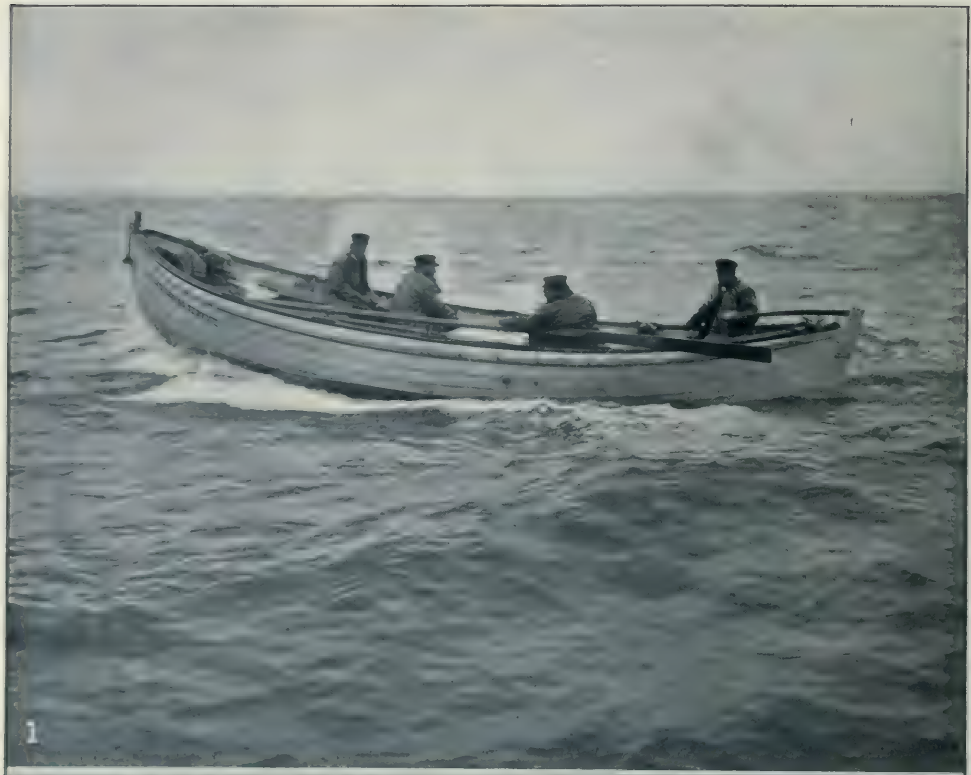


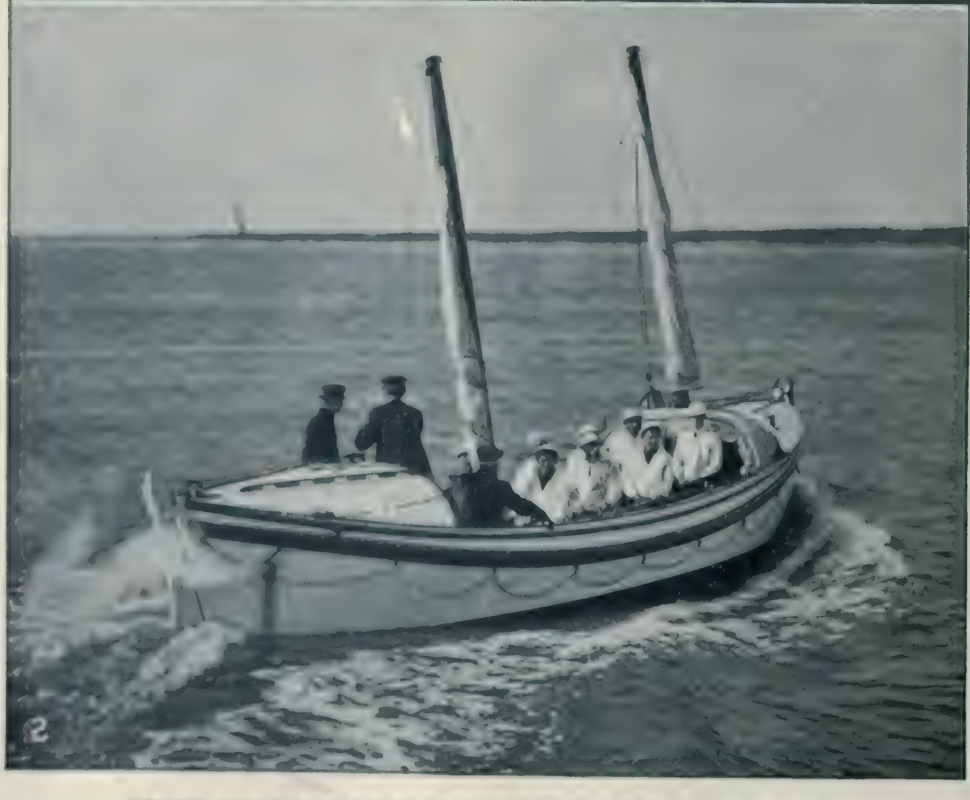
UNITED STATES COAST GUARD 26-FOOT SELF-BAILING, POWER SURFBOAT



UNITED STATES COAST GUARD 36-FOOT SELF-BAILING AND SELF-RIGHTING POWER LIFEBOAT

POWER LIFE-SAVING BOATS OF THE UNITED STATES COAST GUARD
LONGITUDINAL SECTIONS, SHOWING CONSTRUCTION



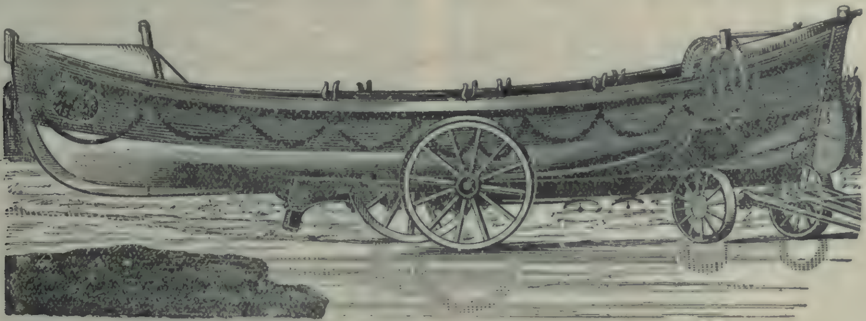


POWER LIFE-SAVING BOATS OF THE UNITED STATES COAST GUARD

1. 26-FOOT SELF-BAILING POWER SURFBOAT
2. 36-FOOT SELF-BAILING AND SELF-RIGHTING POWER LIFEBOAT

mediate service. The installation of motive power in the lifeboats has greatly extended the field of operations of the service by enabling the crews to cover long distances to scenes of disaster where otherwise assistance could not be had.

The American lifeboat, extensively used on the ocean and lake coasts of the United States by the Life-Saving Service, known as the Beebe-McLellan self-bailing surfboat, is entitled to rank next to the lifeboat above described in exceptional qualities, and in some respects it is superior to it in all-around work. The makers have applied the self-bailing principle to a convenient surfboat of light weight, about 1000 pounds, which can be transported and launched almost anywhere with ease and celerity, and whose liability to capsize is greatly diminished by reason of its ability quickly to free itself of water. It is a cedar, clinker-built boat, 26 feet long, about 7 feet in breadth, with 4 thwarts, a centreboard or none, as desired, and is fitted with air tanks and delivery tubes. Its light weight, as compared with the cumbersome English lifeboat, is of material advantage to boatmen in American waters, while the self-bailing feature gives confidence to those who handle the craft in rough surf where the chief danger lies in being swamped by a boarding sea. The boat is rigged with righting lines, to be used in case of an upset, and is otherwise equipped for all emergencies. It can be carried on shipboard with little trouble.



ENGLISH LIFEBOAT.

The introduction of motor power into this boat has given additional support to the claim of high rank for the American boat. This self-bailing power surfboat is the first and probably the best power surfboat used in any life-saving service and is fast displacing the oar-propelled self-bailing surfboat herein described. The weight of the engine, which is in the centre of the boat and as low as possible, adds to the stability of the boat. The engine is a 12-horsepower, 2-cycle, 3-cylinder horizontal motor, inclosed in a water-tight compartment. The eight oars carried are chiefly used for launching and landing through the surf and for manœuvring about wrecked vessels. There are two 15-inch propellers, one on each side of the stern of the boat, which, by means of a lifting and lowering device, may be drawn up close to the planking so that the propellers will not be injured during launching and landing. This type of boat weighs about 3000 pounds and is not too heavy to be transported along the beach on a boat wagon from which it can be lowered to the water with comparative ease. The introduction of motive power in this boat makes it possible for the boat's crew to arrive on the scene of disaster more quickly and with strength and efficiency unimpaired by the extreme exertion of rowing.

There are many other types of boats designed for saving life, the greater number being for use on merchant ships. The characteristics deemed most essential in these are lightness, buoyancy, and seaworthiness. What is known as the New England whaleboat, long, rather narrow, sharp at both ends, and steered with an oar, is much favored by seamen. Collapsible boats of various patterns, which occupy little space when not in use, are likewise employed, as well as ordinary metallic boats, the latter being less liable to injury when exposed to undue heat and moisture. Consult: Axel Welin, *Appliances for Manipulating Lifeboats on Sea-Going Vessels* (London, 1908; supp., 1911); U. S. Merchant Marine and Fisheries Commission, *Automatic Life Boat Launching Apparatus for the Better Protection of Lives of Passengers and Seamen* (Washington, 1910); Sir John Cameron, *The Life-Boat and its Work* (London, 1911); A. A. Sawman, *The Life-Boat and How to Take Care of Her, Containing Descriptions of Construction, Equipment, and Capacity of Life-Boats Carried on Board Steam Vessels* (Brooklyn, N. Y., 1912); N. T. Methley, *The Life-Boat and its Story* (London, 1912). See LIFE-SAVING SERVICE; SAFETY AT SEA; and kindred articles.

LIFE BUOY. A float intended to support persons who have fallen into the water until other assistance can reach them. Those in common use are large rings of cork-stuffed canvas, each about 30 inches in diameter with a life line looped to the outer side. The wearer gets within the ring, with his arms thereon, and is sustained. These buoys are usually kept at convenient places on shipboard, wharves, etc., where they may be readily detached and thrown to any one in danger of drowning. More elaborate buoys of the circular type, used in the navy and merchant marine, are fitted with markers, so that they may be easily seen when afloat, or with lights which ignite upon contact with the water or by an automatic device as they are released from their places. Life buoys are also constructed of rubber tubing, inflated; but these are liable to damage by being punctured or torn, or are apt to decay prematurely. A buoy, with an opening in the ring, shaped like a horseshoe, has been found to answer its purpose very well. See LIFE-SAVING SERVICE.

LIFE ESTATE. In the common-law system of England and the United States, an estate in land for the life of the tenant or of another. In quality the life estate is a freehold, and therefore of more importance than any leasehold, however long; but in point of quantity or duration it is rated as inferior to the freeholds of inheritance, viz., the fee simple and the fee tail. Historically considered, however, it is of more importance than any of these, being the original form of the fee, or feud, and the most characteristic form of feudal tenure of land. See Fee.

The ordinary classification divides life estates into the "conventional," or such as arise by agreement (*conventio*), and the "legal," or such as arise by operation of law. The ordinary life estate, created at common law by livery of seisin and to-day by deed or will, belongs to the former class. The latter includes the matrimonial estates, curtesy, and dower (qq.v.), and a form of fee-tail estate which is no longer capable of inheritance, technically called "fee tail after possibility of issue extinct." But, however created, the qualities and incidents of life estates are the same. They come to an end abruptly on the termination of the life or lives by which they are measured, leaving no interest to descend to the heir of the life tenant or to pass to his devisees under his will. Being in quantity or duration less than the fee out of which (as the expression is) they are "carved," the land does not, upon the termination of the life estate, go to the state by escheat, but returns to the holder of the fee simple as a reversion or remainder (qq.v.). Though a freeholder, the tenant for life is liable for waste committed or "suffered" by him on the premises and is subject to an obligation of fidelity to his landlord, the reversioner, or to the remainderman. A breach of this obligation, as by making a wrongful conveyance of the premises in fee simple by feoffment, involved a forfeiture of the life estate to the injured landlord. This characteristic of the estate has disappeared with the abolition of feoffment and other "tortious conveyances." See Feoffment; Forfeiture; Waste.

Subject to his liability for waste, the life tenant has most of the rights of an owner of the land. He might at common law protect his possession by the same ancient and exclusive remedies as were available to the tenant in fee simple. His estate is regarded as real property, and not, like a leasehold, however long, as personal estate. He is entitled to estovers (i.e., wood for fuel and repairs, and the like), and his personal representatives are, after his death, entitled to the emblements, or growing crops. (See Emblements; Estover.) He may, by the methods appropriate for the conveyance of freeholds (livery of seisin, deed), freely alienate his estate, though he cannot in general give an estate to endure beyond his own. It is not uncommon, however, in creating a life estate, to confer upon the life tenant a power to lease the premises for 21 years or other determinate period, and a lease so made holds good notwithstanding the prior termination of the life estate. In England, where life estates are frequently created as an incident of marriage settlements for providing a revenue for the parties to the marriage and their issue, it has been provided by statute that such a life tenant may make long leases not subject to the life estate. (Settled Land Acts, 1882, 1890.)

An estate for the life of another than the tenant himself (still known by its Norman-French description as an estate *pur auter vie*) may arise either directly, as by a grant of land to A for the life of B, or indirectly through a conveyance by a life tenant of his life estate to another. In neither of these cases does the estate come to an end upon the death of the tenant *pur auter vie*, the person by whose life the estate is measured (known as the *cestui que vie*) being still alive. In that case there is an unexpired fragment of the life estate remaining, which, at the common law, vested in the first person to take possession thereof (known as the "general occupant") or in a person designated by the creator or the tenant of the life estate (known as the "special occupant"). This remnant of an estate *pur auter vie* is now generally disposed of by statute, going either to the heir or to the personal representative of the life tenant. See Occupancy. See also Estate; Fee; Tenure; and authorities referred to under Real Property.

LIFE FOR THE CZAR, The. The first national Russian opera, by Glinka (q.v.), first produced in St. Petersburg, Dec. 9, 1836.

LIFE GUARDS. The First and Second Regiments of Life Guards are cavalry regiments of the British Household Cavalry and are stationed at Windsor and Regent's Park, London, respectively. They are the senior regiments of the Household Brigade and, being the personal regiments of the sovereign, are not required to go on foreign service. This rule, however, has been broken in every great campaign in which since their organization England has been engaged; notably at Dettingen, in the Peninsular campaign, Waterloo, Tell el-Kebir, in South Africa, and in the European War of 1914. In this latter conflict the Fourth Cavalry Brigade had a composite regiment, made up of detachments of the Household Cavalry. They had their origin in 1660, being then composed of the cavaliers forming a bodyguard for Charles II. Subsequently two troops of horse grenadiers, raised respectively in 1693 and 1702, were reorganized in 1783 as regiments of life guards. They are armed with sword and carbine, mounted on heavy black chargers, and wear a dress uniform consisting of white leather breeches, knee boots, red coat, steel helmet and cuirass, the former surmounted by a high plume. The rank and file are required to be over 6 feet in height before enlistment. Each regiment carries four standards, their motto being *Dieu et mon Droit*. In time of peace they are more or less occupied in the performance of duties about the court and metropolis.

LIFE INSURANCE. Life insurance is a term used to cover a variety of transactions in all of which the uncertainty of human life plays a more or less important part. In its purest form a life-insurance contract contains an agreement on the part of the insurer to pay a stated sum upon the death of the insured, if that event occurs while the policy is in force. In recent years, however, the investment principle has come to be quite as prominent in life underwriting as the insurance principle, and through the combination of the two principles there has developed the great variety of policies now written by life-insurance companies.

History. Originally life insurance was not much more than an incident of marine insurance. When the success or failure of a voyage depended largely on the personal qualities of the master of the ship, the owners of ship and cargo would insure themselves not only against the perils of the deep, but also against the danger of loss through the death of the master; that is, they took out insurance on the life of the master for the voyage. These early life-insurance policies were written by individuals long before life-insurance companies came into existence. The earliest policy of which anything definite is known was issued in London in 1583, insuring the life of one William Gybbons for 12 months. This was underwritten by 13 persons acting individually; the premium was $80 per thousand. A similar policy would cost to-day about $10, at age 35.

The earliest life-insurance company of which we have definite information was established in 1699 by the Mercers' Company of London for the benefit of the widows and orphans of subscribers. The business of the company was limited to annuities, but rates were inadequate and it soon failed to fulfill its obligations. The oldest existing life-insurance companies are the London Assurance Corporation and the Royal Exchange Assurance Corporation, both of which were chartered in 1720 and began to issue life policies in 1721. Life insurance, however, was at first but a minor feature of their business, nominal in amount and limited to short-term contracts. The Equitable, established in 1762, was the first office to devote itself exclusively to the business of life insurance and to make use of the scientific methods which characterize modern underwriting. The only other surviving English society which came down from the eighteenth century was the Pelican, which was founded in 1797, and was recently combined with the Empire, both being now merged in the Phœnix.

LIFE INSURANCE IN THE UNITED STATES

YEAR	No. of companies	No. of policies	Insurance in force	Assets	Surplus
1880	30	608,681	$1,475,995,172	$417,951,009	$71,561,669
1885	29	814,691	2,023,517,488	523,664,678	92,749,486
1890	30	1,272,895	3,542,965,751	753,228,759	* 88,739,362
1895 †	35	1,877,808	4,818,170,945	1,142,419,926	159,750,174
1900	40	3,071,253	6,947,096,609	1,723,737,723	158,277,942
1905	43	5,306,161	10,553,839,955	2,651,316,714	‡ 362,357,798
1910	33	6,050,617	11,669,700,062	3,693,248,328	198,534,073
1913	34	7,452,154	14,304,638,791	4,417,298,211	256,936,224

* The apparent decrease of surplus in 1890 was due to the change from the American Experience Table at 4½ per cent interest to the Actuaries' Table with 4 per cent interest. That of 1910 is due to several circumstances, among them the change of base of valuation to 3 per cent, the rapid payment of maturing deferred dividends, the temporary decline of market values of securities, and the withdrawal of a number of outside companies on account of the newly enacted restrictions of the New York insurance law.

† In 1895 and later years assets and surplus of companies transacting principally or solely industrial insurance appear in the table. Number of policies and amount of insurance in force are exclusive of industrial insurance.

‡ The extraordinary increase in surplus in 1905 was due to including items not included before 1901.

The Presbyterian Ministers Fund Life Insurance Company of Philadelphia is often erroneously referred to as the "oldest company in America." It is in fact the successor of a church benevolent society which was incorporated in 1759 under the name of the "Corporation for the Relief of Poor and Distressed Presbyterian Ministers, and of the Poor and Distressed Widows and Children of Presbyterian Ministers." Its early operations were limited to the payment of annuities, but its plan was unscientific and its rates inadequate. It was not properly a life-insurance company, and the amount of business done was little more than nominal. It did not begin the issue of regular life-insurance policies until late in the nineteenth century, probably in 1875, when its charter was amended and its present name adopted. Several similar societies were incorporated in the eighteenth century, but these ceased to exist after a few years. The first general life company, the Pennsylvania Company for Insurances upon Lives and Granting Annuities, was chartered in Philadelphia in 1812. It is still doing business as a trust company, but ceased writing life insurance many years ago. In 1818 was organized the first Massachusetts company, known as the Massachusetts Hospital Life Insurance Company. This company, also, wrote but little life insurance, soon confining its business to that of a trust company. Several other companies were organized in the next 20 years, among them the New York Life Insurance and Trust Company, chartered in 1830. Like the other early companies, it soon ceased issuing life-insurance policies, but continues to sell life annuities, and is to-day one of the substantial trust companies of New York. It still has two life-insurance policies in force (September, 1914), one issued in 1859, at age 22, and the other in 1860, at age 20. It was not until in the early forties that American life insurance began to assume large proportions. In that decade some of the most prominent of existing companies were established. The Mutual Life of New York began business on Feb. 1, 1843; The New England Mutual of Boston, Feb. 1, 1844; the Mutual Benefit of Newark, N. J., April 1, 1845; the Nautilus, now the New York Life, April 12, 1845; the State Mutual of Worcester, Mass., June 1, 1845; the Connecticut Mutual of Hartford, Dec. 15, 1846; and the Penn Mutual of Philadelphia, May 25, 1847.

After the Civil War a large number of new companies entered the field and a period of intense competition followed. The resulting laxity in the inspection of risks and great expenses of management, with lack of adequate State supervision, led many of the newer and less conservative companies into financial difficulties. During the decade following 1870 a considerable number of companies failed and many others reinsured their risks and were forced to retire from business. This aroused a hitherto unknown feeling of distrust in the minds of the people and caused a falling off in the amount of business, from which some companies were 15 years or more in recovering, though others were but little retarded in their growth. The seriousness of the decline during this period is shown by the following statistics of the insurance in force in companies reporting to the New York Insurance Department: 1870, $2,023,000,000; 1875, $1,922,000,000; 1880, $1,524,000,000; 1885, $2,023,000,000. During the same years the number of companies which reported to the New York Department fell from 71 to 30. Since 1880 the growth of the business in the United States has been steady and rapid. According to the Year Book for 1914 the insurance in force in American companies on Dec. 31, 1913, amounted to $16,168,781,226. At the same time there were industrial policies in force carrying $3,906,046,899, or more than $20,000,000,000 in all.

A very large proportion of the life insurance in force in the United States is in the hands of companies making reports to the New York State Insurance Department. The extraordinary growth of the business since 1880 may be perceived from the preceding table, compiled from these reports.

Technique. The principles by which premium rates are determined in life insurance are few and simple, though the practical application of the principles involves elaborate mathematical calculations and formulæ. The attempt here is to bring out clearly the nature of the fundamental principles. Any one desiring to investigate the mathematical side of the subject will find abundant material in *The Principles and Practice of Life Insurance* (8th ed., New York, 1912).

Uncertainty in respect of the duration of a single life was from the first the chief difficulty to overcome in forecasting the probable future cost of life insurance. How long a particular individual will live cannot be known in advance; but mortality tables have been constructed from the experience of the past, which indicate approximately how many of a large number of persons, all of a given age, will die within a year; how many will live more than one year but die within two; how many will die within 10 years, 20 years, or any given number of years, until all are dead.

Mortality Tables. The discussion of the general subject of mortality tables will be found in the article on VITAL STATISTICS. We shall note only a few tables which have been in general use among life-insurance companies. The early policies were for short periods, and rates were based rather on guesswork than on any definite notion of the actual risk assumed. The premium rates were accordingly high and were independent of the age of the insured. The Amicable of England, which worked on the assessment plan, continued as late as 1807 to make uniform assessments on all ages, partially protecting itself by admitting to membership only persons between 12 and 45 inclusive. No stated sum was promised as a death benefit, but the yearly receipts, less expenses, were distributed annually among the representatives of those who had died during the year. When the more exact calculation of risks was attempted the early English companies relied chiefly on tables prepared by Halley (1693) and Süssmilch (1741). Afterward the Northampton table came into general use. This was prepared by Dr. Thomas Price from the registers kept in the parish at Northampton for the years 1735 to 1785. The Northampton table was later superseded by the Carlisle table. This was prepared by Joshua Milne about 1815 on the basis of two classes of statistics, enumerations of the population of two parishes of Carlisle in 1780 and 1787 and the records of deaths in the two parishes for the years 1779 to 1787. Although the data on which the table was based were very scanty, the total number of deaths, e.g., being only 1840, they were worked over with so much care that the results were much more accurate than those embodied in the Northampton table.

All the tables thus far referred to, as well as others of the same period, were based on the life experience of the general population. The first table which took account only of insured lives was based on the experience of the Equitable Assurance Society of London and was published in 1825. Comparatively little use has been made of this table, but a similar table, based on the combined experience of 17 English life-insurance offices and published in 1843, though never used by English companies, was formerly used by many American companies, and is still used in the calculation of reserves on certain policies issued not later than 1906. It is variously known as the Actuaries' Table, the Combined Experience Table, and the Seventeen Offices' Table. The British Offices Life Table, based on the experience of 60 British offices from 1863 to 1893, was the result of the first investigation in which account was taken of the plan of insurance. The O^{M} Table (ordinary life, participating, males) was published along with the $O^{M(5)}$ Table in 1902, and these, either alone or in combination, have gradually superseded the H^{M} Table (healthy males) for valuation purposes. At the present time (1915), practically all British offices use the new tables.

The early American offices adopted English tables, first the Northampton, later the Carlisle, and afterward the Actuaries' or Combined Experience Table. The American Experience Table was constructed by Sheppard Homans, then the actuary of the Mutual Life Insurance Company of New York, about the year 1860. It was based largely upon the experience of the Mutual Life, only lives which had been insured more than five years having been taken into consideration. The table is now used by practically all American companies, save that some companies compute the reserves of their earlier policies by the Actuaries' or Combined Experience Table and 4 per cent interest. The following tables show the number surviving at the end of 10-year periods out of 1000 living at age 10 according to the different tables mentioned above. For purposes of comparison data have been added from the mortality table recommended by the National Fraternal Congress for the use of fraternal beneficiary societies. This table starts with age 20, and not with age 10, as the other tables do. In order to make a ready comparison possible, the Fraternal Table as here given assumes 925 living at age 20.

NUMBER SURVIVING AT DIFFERENT AGES ACCORDING TO DIFFERENT MORTALITY TABLES

AGE	Northampton	Carlisle	Actuaries'	American	Fraternal
10	1,000	1,000	1,000	1,000	. . .
20	904	943	933	926	925
30	773	873	863	854	878
40	641	786	787	781	826
50	503	681	695	698	756
60	359	564	560	579	646
70	217	372	358	386	456
80	83	148	133	145	188
90	8	22	13	8	15

Inasmuch as it is impossible to forecast beyond question the exact future mortality experience of any company, we should select for use in calculating premiums a mortality table which indicates a somewhat higher death rate than well-managed companies are likely to sustain. This the American Experience Table does, but the heavy saving in mortality over this table shown by many companies accrues chiefly in the earlier years of insurance and is largely due to recent medical selection. The New York insurance law assumes that the mortality in the first year of insurance will be 50 per cent of that indicated by the American Experience Table, 65 per cent the second year, 75 per cent the third year, 85 per cent the fourth year, 95 per cent the fifth year, and that after five years the mortality will follow the table. This assumption is based upon the theory that the effect of medical selection will have disappeared after five years, no insured lives which had been examined within five years having been considered in the construction of the table. As a matter of fact, all well-managed companies do show some saving in mortality during the whole period of insurance, which is as it should be. There must inevitably be either a saving or a loss, and every consideration of safety requires the use of a table which will result in the former rather than the latter. The following figures are taken from the American Experience Table of Mortality and will serve to show the character of a mortality table. The figures from age 30 to age 90 are here condensed in order to shorten the table. Other columns are often added, such as one giving the ratio of deaths each year to the number living at the beginning of the year, and one giving the expectation of life at each age.

AMERICAN EXPERIENCE TABLE OF MORTALITY

Age	Number living	Number dying	Age	Number living	Number dying	Age	Number living	Number dying
10	100,000	749	23	90,471	720	70	38,569	2,391
11	99,251	746	24	89,751	719	75	26,237	2,476
12	98,505	743	25	89,032	718	80	14,474	2,091
13	97,762	740	26	88,314	718	85	5,485	1,292
14	97,022	737	27	87,596	718	87	3,079	933
15	96,285	735	28	86,878	718	88	2,146	744
16	95,550	732	29	86,160	719	89	1,402	555
17	94,818	729	30	85,441	720	90	847	385
18	94,089	727	40	78,106	765	91	462	246
19	93,362	725	50	69,804	962	92	216	137
20	92,637	723	56	63,364	1,260	93	79	58
21	91,914	722	60	57,917	1,546	94	21	18
22	91,192	721	66	47,361	2,070	95	3	3

Calculation of Premiums. As already intimated, we shall not undertake to explain here the technical methods employed by the actuary in the calculation of premiums; it is essential for the policyholder and the layman to understand merely the principles upon which the computation is based. We would point out first that the life-insurance premium consists of two parts, the *net premium* and the *loading*. The latter is for expenses and contingencies and will be explained more fully farther on. The net premium is for one purpose only—the payment of policy claims. It is vitally important to know, therefore, that the net premium is sufficient beyond a peradventure for the purpose named.

The American Experience Table of Mortality starts with 100,000 persons at the age of 10 and, according to that table, 63,364 of these will live to attain the age of 56. Adopting these figures for convenience' sake, let us suppose that we have 63,364 persons, all of the age of 56, to be insured for $1000 each on the ordinary life plan. (The ordinary life policy is the simplest form of whole-life insurance, if we except the single-premium life, which is rarely written.) The premiums on the ordinary life are to be paid annually during the remaining lifetime of the insured, and the policy is to be paid only at death. The premiums paid by these 63,364 policyholders are to constitute a common fund which, with interest, will be sufficient to pay $1000 to the beneficiary of each policyholder at death, to the last man.

Net Single Premium. To simplify the matter, let us suppose first that our 63,364 persons are to be insured for the tenth year only; i.e., all are to contribute equally to a common fund which will suffice to pay $1000 to the beneficiary of each one who dies in the tenth year, those who die before or after the tenth year to receive nothing. The mortality table indicates that 1980 of the 63,364 persons will die in that year. We know therefore that we must prepare to pay to the beneficiaries of these 1980 persons in that year the total sum of $1,980,000. Let us assume that we are to collect of each of these 63,364 persons his pro rata share of this money at once, for a good many will die before the tenth year comes. It is not necessary, however, that the entire amount of $1,980,000 be collected immediately, for the funds in our hands will earn interest during the 10 years, and we shall need therefore only the present worth of that sum. We do not know in advance what rate of interest will be earned; but, in order to be absolutely safe, we shall assume a rate so low—say 3 per cent yearly—as to make morally certain that no less will be earned. Now the sum of $1,473,305.94 at 3 per cent compound interest will amount to $1,980,000 in 10 years. It follows therefore that if our 63,364 policyholders will make up to-day a total fund of $1,473,304.94, we shall have money enough, if our funds earn 3 per cent interest, to pay the beneficiaries of all those of their number who die in the tenth year the sum of $1000 each, or a total of $1,980,000. All policyholders, being of the same age, must contribute equally to the fund. Dividing the required amount, $1,473,305.94, by the number of contributors, 63,364, we obtain the sum of $23.25. This sum, called the net single premium, is the amount which each individual member must contribute in order to provide for the deaths of the tenth year.

The mortality table shows how many of our policyholders will die in each and every year—1260 in the first year, 1325 in the second year, 1980 in the tenth year, 1292 in the thirtieth year, etc., until in the fortieth year only three, at the attained age of 95, remain to be provided for. According to the mortality table these three will die in the ensuing 12 months, requiring the payment of $3000 in the fortieth year. If, now, we can determine in the manner illustrated the sum that each one of our company must pay in order to provide for a death benefit of $1000 for all who die in the tenth year, we can as readily determine the amount that each must contribute to provide for the deaths of the first year, the eleventh year, the thirtieth year, and of every other year including the fortieth, when the last three policyholders pass away according to the table. Computing in this manner all the net single premiums that would be required for the payment of the death claims of each year, we find that the total of these net single premiums will be $621.18. That sum, therefore, is the net single premium which must be paid at once by each of the 63,364 persons in order to provide a fund sufficient, with 3 per cent compound interest, to pay all death claims as they accrue in each year thereafter according to the mortality table until the last policy matures.

Net Annual Premium. Most persons, however, would not find it convenient to pay for their life insurance in a single sum. They would generally prefer to pay a small premium each year during life—the annual premium. The *net* annual premium is found by dividing the net single premium by the value, or cost, of a life annuity of $1, the first payment of $1 to be made immediately. Such an annuity in this case would call for the immediate payment of $1 to each of our 63,364 persons, a total of $63,364. The mortality table indicates that 62,104 will be living at the beginning of the second year, requiring the payment of $62,104 at that time. In like manner, $49,341 will be required to pay $1 to each of those surviving at the beginning of the tenth year, $5,485 to pay the annuities accruing at the beginning of the thirtieth year, etc. Thus we determine the several amounts that will be required to pay the annuities of each year, including the last payment of $3 at the beginning of the fortieth year. The sum of the present worths of these several amounts, discounted at 3 per cent, will be the total fund required at the beginning to make certain the payment of a life annuity of $1 to each of the 63,364 annuitants. Dividing the total amount thus obtained by 63,364 we get $13.006, which is the net value of a life annuity of $1 at age 56.

Now if $13.006 will buy a life annuity of $1 at age 56, the sum of $621.18 (the net single premium of a whole life policy of $1000 at age 56) will buy a life annuity of as many dollars as $13.006 is contained times in $621.18. Dividing, we obtain $47.76. Inasmuch, then, as the net single premium of $621.18 will, at age 56, pay in full for a whole life policy of $1000, and inasmuch as the same sum will buy at the same age a life annuity of $47.76, it is obvious that the sum of $47.76 paid at the beginning of each year during life is the mathematical equivalent of $621.18 paid in a single sum. That is, the net single premium of $621.18 is the mathematical equivalent of a net annual premium of $47.76. Accordingly, if each of our 63,364 persons will pay the sum of $47.76 immediately, and the same sum at the beginning of each year thereafter during life, the payments will be sufficient to create and maintain a fund large enough to pay the sum of $1000 as each member dies, until the last three have passed away at the attained age of 96. Obviously the sum of $47.76 is the net annual premium required.

Limited-Payment Life. In lieu of paying premiums yearly until death, as in the case of an ordinary life policy, payment may be completed within a limited number of years, such a contract being known as a limited-payment life. A 20-payment life, e.g., calls for the payment of only 20 premiums, the policy being payable at death, as any other whole-life contract. To compute the premium of a limited-payment life policy we must first find the value of a temporary annuity—an annuity contract which terminates at the end of a stated period or at prior death. The value of a temporary annuity terminating in 20 years is computed by a process similar to that used in the case of a life annuity, save that we consider the survivors at the beginning of each year for 20 years only, instead of until age 95. To find the net annual premium of a twenty-payment life, divide the net single premium of a whole-life policy by the value of a 20-year temporary annuity.

Term Insurance. A form of temporary protection is offered by what is known as term insurance. A 20-year term policy, for illustration, is payable only at death, and then only in case death occurs within the 20 years. At the end of that period the policy terminates without further value. The net single premium of a 20-year term policy is computed by a process similar to that used in computing the net single premium of a whole-life policy, save that the deaths of only 20 years are considered. To find the net annual premium, divide the net single premium by the value of a 20-year annuity.

Endowment Policy. A pure endowment policy is one which is payable only to those who live to complete the endowment period. Those that die before the end of that period receive nothing. Of 63,364 persons taking pure endowment insurance at age 56, only 23,761, according to the table, will live to receive the endowment at the end of 20 years. This would call for the payment at that time of $23,761,000. To find the net single premium, divide the present worth of this sum by 63,364, the number of persons insured. To find the net annual premium, divide the net single premium by the value of a 20-year annuity.

Regular endowment insurance provides for the payment of the face amount of the policy to the beneficiaries of any who die during the endowment period and to those policyholders themselves who live until the end of the period. This policy may be regarded as a combination of term insurance and pure endowment. Under the former, those who die during the endowment period are paid, and under the latter those who live to the end of the period are paid. The net annual premium of a 20-year endowment policy consists of the net annual premium of a 20-year term policy plus the net annual premium of a 20-year pure endowment.

Endowment insurance does not differ in essence from whole-life insurance. The companies will issue endowments for various periods, to mature in 20, 30, 40 years, etc. An ordinary life policy issued at age 56 matures by the death of the insured in 40 years at the attained age of 96 or earlier, at which time the full amount will be payable. Likewise, a 40-year endowment policy issued at age 56 would mature at the attained age of 96 or at prior death. In other words, the net premium for an ordinary life policy issued at age 56 would be precisely the same in amount as the net premium for a 40-year endowment, and the two policies will be in every particular essentially the same.

Step-Rate Insurance. Natural premium insurance, yearly renewable term insurance, the step-rate plan, etc., are terms representing a form of policy which provides protection at current cost from year to year, the premium increasing yearly as the insured advances in age. To illustrate: of 63,364 persons at age 56, 1260, according to the mortality table, will die in the ensuing 12 months. Theoretically, death claims are payable at the end of the policy year, so that in this case the sum of $1,260,000 will be required at the end of the first year. The present worth of this fund discounted at 3 per cent would be $1,223,300.98. Dividing this sum by 63,364, the number of contributors, we get $19.31, the net premium which each contributor must pay at the beginning of the first year. Entering upon the second year at age 57, there will still be 62,104 of the original number living, of whom 1325 will be dead at the end of that year. Computing the premium in the same manner as in the first year, we find that the net premium to be paid at the beginning of the second year is $20.71. In like manner the net premium at the beginning of the third year is $22.27. At age 70, the natural premium would be $60.19; at 80, $140.26; at 90, $441.31; and at 95, $970.87. It will be seen that while this form of protection is comparatively cheap in the earlier years, the cost becomes prohibitive in advanced age.

Loading. In the matter of loading there is considerable diversity. The loading is the sum added to the net premium to provide for expense of management and for contingencies, the greater part usually being required for expenses. The loading varies greatly in different companies and in different forms of insurance. In participating insurance, issued by purely mutual companies or by stock companies operating on the mutual plan, so much of the premiums paid as can be saved by reason of safe and profitable investments and an economical management is refunded to the policyholders in the form of so-called dividends. In nonparticipating insurance all that may be thus saved from the premiums paid commonly reverts to stockholders. In participating policies the loading is generally about 25 per cent of the gross premium; while in nonparticipating insurance it is much less, sometimes little more than nominal, the management relying largely upon the gain from excess interest earned and the gain from saving in mortality for payment of expenses and dividends to stockholders.

During several decades prior to 1906, owing chiefly to keen competition for new business, the expense of management had increased to an unwarranted extent. By the New York law, enacted in 1906, certain restrictions calculated to reduce the expense of management to the minimum were imposed upon the companies. One immediate effect of these restrictions was the withdrawal from New York State of a number of companies not domiciled therein; but the expenses of all domestic companies and of all foreign companies continuing to do business in New York are now much lower than formerly, and lower in almost all cases than those of companies not conforming to the New York law. Indeed, all companies doing business in New York are competing keenly with one another in their efforts to reduce the expense of management to the lowest point consistent with business efficiency, and to furnish life insurance at the lowest possible net cost. Again, while expenses in every other line of business have largely increased in the last two or three decades, the net cost of life insurance to-day, in most companies of the better class, is lower than at any previous time in many years. The publicity which insurance departments now require of the companies in respect of every phase of their business renders it impossible for the latter to conceal the cost of new business, or other expenses, even were they disposed to do so. Whether the loading is relatively large or small has little bearing on the cost of life insurance. All companies operating on the mutual plan return to the insured (in most cases annually) the unused portion of the loading in the form of so-called dividends. An important office of the loading is to provide for unforeseen contingencies, such as a mortality in excess of the tabular, a rate of interest earned less than that assumed, an increase in cost resulting from adverse legislation, wars, pestilence, exorbitant taxation, etc. The larger the loading the better equipped will the company be to withstand any unusual strain that may come; while in the absence of any adverse contingencies the excess loading is promptly returned to the insured.

Medical Examination. The early mortality tables were constructed on the basis of the mortality of the general population. In the absence of restrictions it is obvious that insurance companies would suffer from an unfavorable selection of risks. The unhealthy and the weak would seek the benefits of insurance, while the strong and healthy would make comparatively little use of it. To avoid such unfavorable selection, insurance companies endeavor to limit their operations to persons of average expectation of life and to bar out those below the average. In the beginning, therefore, insured lives are a selected class, and might be expected to show a death rate considerably below the average for the general population. It is commonly claimed, however, that through the tendency of the stronger to surrender their insurance readily and of the weaker to keep theirs up as long as possible, the entire benefit of the original selection is lost within five or six years.

The original selection of risks was made chiefly on the results of the medical examination. The medical examiner is required to ascertain from the applicant personally all needed facts relating to family and personal history, as well as to present physical condition and evidences of past disease. Among the facts to be elicited are the following: age and occupation, residence; whether or not he has been rejected or postponed because of illness or risk; use of liquors and of tobacco; service in army or navy, or rejection by recruiting officer; height and weight; race and sex; presence of hernia, or results of accident or injury; hereditary influences, as inferred from age and condition of health of parents and of four grandparents, if still alive or at time of death, with cause of death in each case; similar facts regarding brothers and sisters; existence of pulmonary tuberculosis or insanity in any part of family; all diseases from which applicant has suffered, with date, duration, severity, and result in each case, as well as name of attending physician; present condition of physical health and evidence of tendencies towards disease. Moral hazard must be considered as well as physical condition. From this information the examiner is asked to judge of the risk as a partial guide for the medical director.

Termination of Policies. There are five ways in which life-insurance policies may be terminated: by maturity, by death, by expiry, by lapse, or by surrender. The method of settling endowment policies at maturity is simple and presents few points of interest. The payment of death claims is hedged about with more formality. Formerly companies were disposed to take advantage of technicalities in order to avoid paying claims of doubtful validity, but now reputable companies show commendable willingness to settle on receipt of proofs of death when fraud is not apparent. In the nature of things the chief reliance for such proof is on medical testimony. The termination of a pure endowment by death and the discontinuance of a term policy at the end of the period for which it was issued are examples of termination by expiry.

Lapses and Surrenders. A policy is said to lapse when it terminates through failure to pay an accruing premium, the default occurring before a surrender value of any kind has accrued. A policy is surrendered when it is terminated at the request of the policyholder, or by failure to pay an accruing premium, after a surrender value in the form of cash, paid-up, or extended insurance has accrued or is allowed. The proportion of policies surrendered or permitted to lapse is large. A great many deferred-dividend policies are surrendered at the completion of the dividend period, the policyholder treating them as endowment insurance, the guaranteed cash value and the accruing dividend together frequently approximating, and sometimes exceeding, the face amount of the policy. Surrenders are also largely increased through policy loans. The loan values contained in modern policies are a constant temptation to borrow to meet some real or fancied need. Such loans are rarely repaid directly, but are deducted from the proceeds of the policy at death, or from the guaranteed cash value in case of default in payment of premium or interest. Most policies carrying loans are surrendered sooner or later. During the five years 1909–1913 the regular life-insurance companies reporting continuously to the New York Insurance Department issued policies on which the first premiums were actually paid which carried insurance to the amount of $7,870,665,643; during the same five years they wrote off their books $4,590,727,729. The amount terminated by lapse or surrender was $2,978,302,102. In 1913 the amount terminated in regular ways was $355,725,818, while $723,469,303 was terminated by lapse or surrender.

Reserve and Surplus. The general public has ordinarily very confused ideas regarding the reserve in life insurance. Simply defined, the so-called reserve is merely the insurance fund—the fund from which all policy claims are paid. No policy is ever paid, either in whole or in part, from any other source; nor can any part of the reserve be applied legitimately to any other use than the payment of policy claims. In illustration we again take the example of 63,364 persons at age 56 insured for $1000 each on the ordinary life plan. The net premium (exclusive of loading) to be paid annually by each policyholder until death is $47.76 (carried to six decimal places, the net premium is $47.760895). That part of the premium which constitutes the loading, being for expenses and contingencies only, is not considered in this illustration. The initial reserve, or insurance fund, at the beginning of the first policy year consists of the total net premiums paid by the 63,364 policyholders, amounting to $3,026,321.35. To this fund we add 3 per cent ($90,789.64) on account of interest, the premium having been calculated on the assumption that the interest earned each year would be sufficient to increase the reserve at that rate. Adding the interest we get $3,117,110.99, which is the maximum reserve, or insurance fund, of the first year. According to the table 1260 of our 63,364 policyholders will die in the first year, calling for the payment of $1,260,000 in death claims. Deducting this sum from the total reserve we have a balance of $1,857,110.99, which is the terminal reserve of the first year. Twelve hundred and sixty policyholders having died during the year, there are 62,104 still living. The terminal reserve of $1,857,110.99 is the property of these living policyholders as a body, not as individuals. If the fund were to be divided, however, the pro rata share of each policyholder would be $29.90. This is the individual policy reserve at the end of the first year, but it is not the property of the individual policyholder, nor can any part of it be withdrawn by him save as may be provided in his policy.

At the beginning of the second year the net premiums paid by the 62,104 living policyholders amount to $2,966,142.62. To this sum we add the terminal reserve of the first year, $1,857,110.99, making the initial reserve at the beginning of the second year $4,823,253.61. To this amount add 3 per cent as before, and from the sum deduct $1,325,000 in payment of the death claims of the 1325 policyholders who, according to the mortality table, die in that year. This will leave a balance of $3,642,951.22, which is the terminal reserve, or insurance fund, of the second year, the pro rata share pertaining to each policy being now $59.94.

To complete the illustration proceed in the same manner, collecting the net premium of $47.76 from each policyholder living at the beginning of each subsequent year as indicated by the mortality table; add to the net premium income the terminal reserve of the previous year; to the initial reserve thus obtained add 3 per cent; and from the sum total deduct the death claims of the year as indicated by the table. At the end of the third year the total terminal reserve will be found to be $5,348,184.98, and at the end of the fourteenth year $15,837,373.42. The policyholders still living at the beginning of the fifteenth year are now all 70 years of age, and the tabular death claims of the year will aggregate $2,391,000, a sum in excess of the total net premium income and interest combined. From this time on the drain upon the reserve, or insurance fund, will increase rapidly, and the balance on hand each year will decrease accordingly, for from the beginning no new members have been received to add to the premium income. At the beginning of the twenty-fifth year only 14,474 policyholders are still living and these are 80 years of age; the net premium income is only $691,291.19, and the reserve at the end of the year only $8,376,129.16. As 2091 deaths have occurred during the year, the individual policy reserve at the end of the year is $676.42. At the end of the thirty-fourth year, when the 847 policyholders still living have attained the age of 90 years, the terminal reserve of $724,542.93 is equivalent to an individual policy reserve of $855.42. At the end of the thirty-ninth year, three policyholders, according to the table, will still be living at the attained age of 95. The total reserve or insurance fund will be only $2,769.34, but this is equivalent to an individual policy reserve of $923.11. We now enter upon the fortieth year and the three living members will contribute the sum of $143.28 in premiums. Adding to this premium income the terminal reserve of the previous year, $2,769.34, we have an initial reserve of $2,912.62. Adding

3 per cent, $87.38, we have a total insurance fund or reserve of $3000, or just sufficient to pay the three remaining policies in full; for, according to the mortality table, the three remaining members will not live beyond the end of that year, or beyond the attained age of 96.

Observe that the pro rata reserve pertaining to each policy increases yearly as the insured advances in age, the reserve of a life policy becoming equal to the face amount of the insurance at the attained age of 96. The illustration takes no account of additional lives insured, for the premiums to be paid by the 63,364 policyholders must be sufficient with interest to provide for all death claims occurring in their own number, without depending upon the addition of new blood. No account of lapses or withdrawals is taken in the illustration, for the company is bound to carry every policy to maturity if premiums are duly paid, and it can do no less than assume that every policy will persist to the end. It must therefore be prepared to pay every policy in full when it matures. Lapses and surrenders there will be, but they will not affect the reserve values of the remaining policies. A policy which has been in force the required length of time can be surrendered, and a part or all of the reserve pertaining to that policy may then be withdrawn, as stipulated in the contract. In most companies no surrender value is allowed until the end of the second year, and many allow nothing until the policy has been in force three years. In all companies the surrender value in the earlier years is less than the full reserve pertaining to the policy, but it increases gradually thereafter. Two or three companies allow the full reserve as a surrender value at the end of the third year, many companies do not allow the full reserve until the end of the tenth year, and a large number not until the end of the fifteenth year. When a policy lapses, or when it is surrendered for value, so much of the reserve as may not have been conceded to the withdrawing policyholder is carried to surplus and the reserves of the remaining policies are neither increased nor decreased by the withdrawal. Although the forfeited reserves of lapsed or surrendered policies become surplus, it is not considered that there is any real gain from this source. On the contrary, the withdrawal of sound lives, secured originally at considerable expense, is universally regarded as detrimental to the interests of the company, i.e., to the interests of the remaining policyholders.

In the States whose laws provide for efficient supervision of insurance, the mortality table to be used and the interest rate to be assumed in calculating net premiums are prescribed by law. In most States the American Experience Table of Mortality and a maximum interest rate of 3½ per cent are prescribed, although 4 per cent is permitted in some States. Most of the more prominent mutual companies assume only 3 per cent. This means larger net premiums and reserves than when the assumed rate is 3½ or 4 per cent, and is in the interest of strength and safety.

Dividends. If in practice the mortality experience of a life-insurance company corresponded precisely with that indicated by the mortality table employed, if the rate of interest earned proved always to be the same as that assumed in the calculation of the premium, and if the loading added to the net premium were always just sufficient to provide for the expense of management and for contingencies, the premiums collected on outstanding policies would always be precisely sufficient to pay all death claims, maturing endowments, and other policy claims until the last policy outstanding had matured. There would be no surplus from any source. In actual experience, however, the mortality incurred by a well-managed company proves to be less than the tabular, the interest earned is greater than the assumed rate, and the loading is more than sufficient to provide for expenses and contingencies. From each of the three sources named, therefore, there is a gain—a gain from saving in mortality, a gain from excess interest earned, and a gain from saving in loading. This gain, however, is not a profit on an investment but merely a saving in the estimated cost of life insurance. The premium charged has proved larger than was required for the payment of claims, and in mutual companies the excess will be refunded to the policyholder in the form of a so-called dividend. The New York law requires that the surplus thus accruing shall be distributed among the policyholders "annually and not otherwise," save that a limited portion must be set aside and retained permanently as a contingency reserve, to provide for possible future losses of invested funds, excessive mortality, or other unforeseen contingencies. In stock companies not operating on the mutual plan the accruing surplus belongs to the stockholders, though the stock company, in lieu of apportioning dividends to the policyholders, charges smaller premiums than the mutual company. Some stock companies, though controlled by the stockholders, conduct their business in other respects on the mutual plan, apportioning the accruing surplus to policyholders in the same manner as purely mutual companies. These are called mixed companies.

The surplus in practically all American companies is distributed upon what is known as the contribution plan, under which the holder of a participating policy receives so much of the accruing surplus as has resulted from the premiums paid by him. The apportionment of dividends, however, is not an exact science and the formulæ used by different companies for making the distribution vary slightly according to the judgment of the actuaries, though without doubt approximate justice is always done. In the case of policies written since the 31st of December, 1906, practically all distributions are made on the annual dividend plan. Prior to the date named a number of companies distributed the surplus annually, or deferred the distribution to the end of a stated period, as requested by the insured in his application. The deferred dividend period was usually 5, 10, 15, or 20 years, and the surplus accruing during that period was distributed among the policies in force at the end of the period. Under this plan policies terminating by death, surrender, or lapse during the period received no dividends, the surplus lost by them inuring to the benefit of those that persisted to the end of the period.

Control of Life-Insurance Companies. The control of a mutual life-insurance company rests, in the last analysis, with the policyholders; that of a joint-stock company with the stockholders. But it is generally recognized that the life-insurance business is essentially mutual. The policyholders of the stock company own the reserve or insurance fund, but not the surplus; and although the management of the business is in the control of the stockholders, the rights of policyholders are fully protected by the insurance laws. Immediate control of an insurance company rests in a board of directors, elected by the stockholders in a joint-stock company and by the policyholders in a mutual company.

In order to bring the management of mutual life-insurance companies under the control of the policyholders, the New York Legislature enacted in 1906 a law requiring the removal of the existing directorates of the mutual companies of that State and the election of new boards, invalidating all existing proxies and limiting the validity of new proxies to two months, and prescribing in detail methods of voting in person, by mail, and by proxy. The law also required that the lists of policyholders should be accessible to any policyholder. The law further contained provisions for facilitating the transformation of existing joint-stock companies into mutual companies.

While frequent changes in management are undesirable, and annual struggles for the control of a company, like that carried on in 1906 between the existing management and the International Policyholders' Committee for the control of the New York Life and the Mutual, tend to impair public confidence in the companies, it is generally believed that as a rule the management will have sufficient influence to continue itself in power so long as its policy is generally approved.

Investments of Life-Insurance Companies. The reserves and surplus of the life-insurance companies represent capital for investment amounting (in 1913) to $4,417,298,211 for the companies reporting to the New York Insurance Department. These funds are specially adapted for permanent investment, since under ordinary conditions, with the business of the company remaining stationary, the income from premiums and investments is at least equal to all the expenditures. The fundamental requirements of all investments of life-insurance companies are (1) security of the principal; (2) certainty of income; and (3) the highest income compatible with these requirements. Other things being equal, the higher the interest return, the lower will premiums need to be, or the higher the dividends.

Mortgages on improved real estate, restricted to a limited proportion of the value of the property, meet the above requirements admirably. If due care is exercised by the company in making such loans, they are among the most secure and profitable of investments. The expense of administering such assets is, however, considerable, and the business would become unwieldy with large companies. Real estate itself, as it continually fluctuates in value, is a doubtful form of investment.

The bonds of municipalities in States where municipal corporations are carefully restricted as to their debt-incurring powers form an investment which is secure, easily administered, and profitable. State bonds may be very satisfactory, but the possibility of repudiation exists.

Loans to policyholders upon their own policies, the amount of the loan being restricted to the reserve on the policy, are a perfectly safe investment for the insurance company, and yield a return above the average. Such loans form a considerable part of the investments of most companies. Recent experience, however, indicates that the right of a policyholder to demand a loan at any time on the pledge of his policy, as required by recent laws, may prove detrimental to the interests of the policyholders as a body. In a time of long-continued financial depression the demand for loans or cash value might easily exceed the surplus income of the company. To meet such demands the company might be compelled to sell valuable securities on a depressed market at heavy loss, and in any event it would be precluded from buying high-class bonds at the favorable rates then prevailing. For these and other reasons the National Convention of Insurance Commissioners has recommended a modification of existing laws to authorize the companies to defer the granting of loans or the payment of cash values for a period of six months after demand.

The bonds of great private corporations, excluding industrials, are an exceedingly common form of investment and, with reasonable care on the part of the investing companies, meet all the requirements as to security of principal and certainty of interest. Their yield is often low, as they are much in demand by other investing agencies. Corporation stocks, on the other hand, are generally regarded as unsuitable for the investment of life-insurance funds. They may be quite secure as to income; but their value is constantly fluctuating. In a time of panic the value of such assets might easily shrink to such an extent that an insurance company which had invested largely in them would fall below the minimum of assets required by law for the protection of its reserves, and so be forced into liquidation.

The holder of corporate stocks, moreover, becomes in the measure of his holdings responsible for the management of the companies whose stock he holds. Thus, the insurance companies, through stock holdings in banks, trust companies, railroads, and the like, were forced to concern themselves with the management of business wholly foreign to life insurance, and often to the detriment of the life-insurance business. The New York law now prohibits life insurance companies from investing in corporation stocks, and requires them to dispose of present holdings at an early date.

The assets of the life-insurance companies reporting to the New York department consisted on Jan. 1, 1913, of real estate, $147,078,103; bonds and mortgages, $1,453,931,586; stocks and bonds, $2,014,080,445; collateral loans, $14,317,215; loans on policies to policyholders, $589,312,568; premium notes and loans, $25,612,561; cash in office or bank, $55,403,435; deferred and unpaid premiums, $55,588,366; other assets, $61,973,932; a total of $4,417,298,211. The item classed as stocks and bonds, making nearly one-half of the total assets, consists mainly of securities which find a ready market and are therefore subject to constant fluctuations in their market value, though the real value of bonds is not affected by the daily market quotations. High-class bonds (and life-insurance companies buy no other) are purchased by the companies as a permanent investment for the sake of the income they yield. This income is a fixed percentage of the par value, does not fluctuate in amount, and will be received by the company yearly until the maturity of the bond, the face amount of which will then be paid. These particulars are as certain in the case of high-class bonds as of the best real-estate mortgages.

Obviously such heavy investment in securities many of which are subject to speculative dealings gives the insurance companies a position of extraordinary influence in the financial world. In the floating of a new issue of corporation bonds, or the launching of a new corporation, the support of insurance investment was formerly a factor hard to overestimate. Hence arose the practice of participation by the life-insurance companies in syndicates formed to underwrite large issues of corporate securities. The companies participating in such transactions, as ordinary speculators, disposed of the securities contracted for at an advanced price; and in most cases the syndicate transactions of the past years proved profitable to the companies. At the same time the business was hazardous; and the participation of life-insurance companies in underwriting syndicates has been generally condemned as unsound policy, and is now prohibited by the New York law.

Legislation. The chief activity of State governments in the United States in respect of life insurance is supervision and restraint. The history of life insurance in the United States has shown a marked tendency on the part of some companies to recklessness in the matter of reserves, and it is only the activity of the government which has induced the companies to give to their policyholders adequate protection. Massachusetts was the first State to establish an insurance department (1855). It was also the first State to adopt a scientific method of insuring the solvency of an insurance company. That method is, in brief, to compel it to carry a reserve sufficient to reinsure all its outstanding risks at net premium rates; that is, a reserve which is called for by a calculation based on a specified mortality table and rate of discount. The Actuaries' Table and 4 per cent were specified in the Massachusetts law, and were adopted by most of the other States as they introduced the net valuation test of solvency. Some States, however, authorize the use of a discount rate of 4½ per cent, which diminishes somewhat the amount of reserve required. New York originally used the American Experience Table, then changed to the Actuaries' Table with 4 per cent interest, and Jan. 1, 1901, in recognition of the fall of the rate of interest in safe investments, returned to the American Table of Mortality with interest of 3½ per cent. This has materially increased the amount of reserve necessary for the companies to carry. All the leading mutual companies of New York now (1914) voluntarily use a 3 per cent rate in valuation of new business.

Laws taxing the premiums collected by life-insurance companies within a State are virtually universal. The total taxes paid by the companies in the United States is estimated at $13,000,000 yearly. Such laws are regarded by insurance men as wholly unjustifiable, since they tend to discourage men from making due provision for their families in case of death. Much of the other State legislation, also, is of an unnecessarily burdensome nature. It has been estimated that the total cost of inspection, as conducted by the various States, is at least eight times as great as inspection by a single authority would be. This burden is in most cases borne by the companies.

Formerly a considerable number of the insurance bills proposed in the various State legislatures were chiefly designed, it is alleged, to blackmail the companies. Complaints on this score now are very rare. Apart from blackmailing legislation, there are many laws proposed which the insurance companies are bound to oppose, in the interests of their policyholders. The New York legislative investigation in 1905 disclosed the fact that some of the companies retained agents to watch legislation and to employ appropriate means to defeat obnoxious measures. This work is now in the hands of the Association of Life Insurance Presidents, representing the leading companies of the country. The New York Law of 1906 requires every agent representing a corporation before the New York Legislature to file with the Secretary of State a statement of the services he expects to perform, and to make public a sworn statement of all expenditures incurred.

This law limited the expenses for new business, the total expenses, the new business a company might do annually, and the contingency reserve, or surplus, which it might hold. Companies incorporated in other States and doing business in New York were required to conform to the expense limitations, and the limitation upon new business was afterward imposed on them. The first three limitations named above have since been considerably modified.

Exclusive Federal regulation of insurance is now conceded to be impracticable save by an amendment to the Constitution of the United States, since the Supreme Court has held (Paul *v.* Virginia) that insurance contracts are not articles of commerce and cannot be brought under the Interstate Commerce clause of the Constitution. Discussion of such regulation was an outgrowth of the New York investigation. Under the pressure of popular demand, a legislative commission was appointed in the special session of the New York Legislature of 1905 to examine into the business of the principal life-insurance companies doing business in the State. The commission, consisting of three senators and five assemblymen, with Senator W. W. Armstrong as chairman, began its sessions Sept. 6, 1905, having secured Charles E. Hughes as counsel. The principal companies investigated were the Equitable Life Assurance Society, the New York Life, the Metropolitan Life, and the Mutual Life of New York. As a result of the exposures made by the legislative committee, radical reforms were made in several companies. On Feb. 22, 1906, the Armstrong Committee submitted its report on the insurance companies to the Legislature, and recommended a thoroughgoing reform of insurance legislation. Its recommendations were practically embodied in the Law of 1906, the important provisions of which have already been discussed. See INSURANCE.

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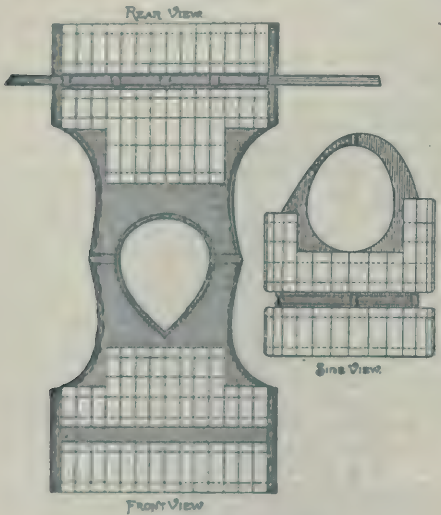
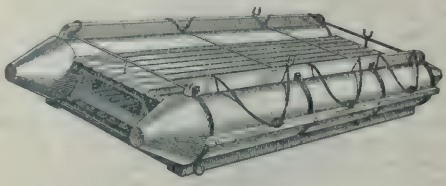
LIFE MORTARS AND ROCKETS. See Life-Saving Guns and Rockets; Life-Saving Service.

LIFE PRESERVERS. Contrivances adjustable to the body for buoying up persons in the water. They are made of various materials and in various forms. The best kind of ordinary life preserver, such as is used on passenger vessels, is made of good, sound cork blocks, or other suitable substance, with belts and shoulder straps properly attached, and so constructed as to place the cork underneath the shoulders and around the body of the person wearing it. It should contain at least six pounds of good cork and have a buoyancy of 24 pounds. Cork cushions, with belts and shoulder straps, are considered good substitutes for the jacket above described when they have the proper buoyancy. Life preservers of an approved pattern are required by law on passenger vessels in the United States, and it is the duty of the inspecting officers to see that they are adequate and serviceable. Oarsmen in the life-saving service of the Coast Guard use an improved belt made of blocks of cork fastened to a cloth lining as shown in the cut. The man adjusts it by thrusting his head through the hole in the lining, the front and back parts falling into position and being secured by a lashing around the waist. This method obviates the necessity for shoulder straps, and, there being but one knot to tie or unfasten, the belt can be readily put on and removed. Tule, deer hair, and kapok are used to some extent in the construction of life preservers. Those in the form of inflated vests and overcoats are seen in service occasionally, and in the British navy swimming collars of rubber inflated were issued during the Great European War of 1914. Waterproof, air-tight life-preserving suits, consisting of headdress, jacket, and trousers, made of rubber or similar material, are seldom employed at the present time except by divers. See Safety at Sea.



A LIFE-SAVING CORK JACKET.

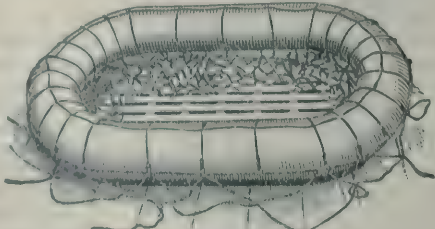
LIFE RAFTS. Structures used in saving life at sea. Nowadays nearly all seagoing steamers carry a certain number of rafts, of some approved description, as an equivalent for a portion of the small-boat capacity they are required to maintain. These floats, as a rule, can be conveniently stowed, are easily transported from one part of the vessel to another, may be launched overboard anywhere, and sometimes prove better instruments than boats for saving the shipwrecked. The devices of this kind are well-nigh innumerable. All depend for their extra buoyancy upon some ingenious method of utilizing air receptacles, cork, etc. Rafts and floats intended to be carried on the decks of ocean steamers must have 4½ cubic feet of inclosed air space for each person that they will accommodate, and those for steamers on lakes, bays, sounds, and rivers, 3½ cubic feet of air space for each person. Such rafts are equipped with life lines and oars.



ORDINARY CYLINDER LIFE RAFT.

An effective contrivance, which is much used on passenger and other vessels, is the metallic cylinder life raft, consisting of two cylinders, cone-shaped at the ends, firmly connected with cross rods, and having slats running longitudinally between the hollow forms. This raft owes its great buoyancy to the air-filled cylinders.

The Carley life float is another and later form of raft. It consists of a copper tube, shaped like an ellipse, which is divided into air-tight compartments. The tube is sheathed with cork, the whole being covered with canvas and made water-tight. A bottom, composed of wooden slats, is suspended from the interior sides of the float by a rope netting about 3 feet deep. The netting is so arranged that, whichever side of the float may fall upon the water, the slatted

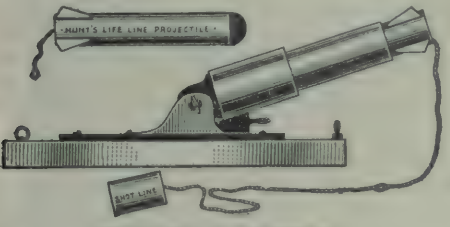


CARLEY LIFE FLOAT.

bottom will go undermost. Oars and a signal flag are lashed to the tube. A large number of persons can be supported by this device, which is constructed in various sizes. See Safety at Sea.

LIFE RENT. In Scots law, the usufruct, i.e., the right to the beneficial use and enjoyment of a heritable estate for life, the person entitled thereto being called a life renter. The estate is nearly equivalent to the life estate of the English and American law, its distinctive features being derived from the Roman or civil-law system, on which the law of Scotland is based. See Civil Law; Life Estate; Usufruct.

LIFE-SAVING GUNS AND ROCKETS. Ordnance used to fire line-carrying projectiles from the shore to a wrecked vessel or vice versa. The Lyle gun, which is more generally used in the United States than any other, is described under Life-Saving Service. American ocean-going steamers are required to be supplied with some approved means of firing lines to the shore. The Hunt gun and Cunningham rocket are employed by many for such a purpose. The former, which was devised by Edmund S. Hunt, of Massachusetts, is mounted on a flat wooden carriage, to which it is fastened at the cascabel by a hinge. Elevation is obtained by use of a quoin between the forward part of the carriage and the under side of the gun. The projectile is the chief feature of the apparatus and consists of a cylindrical tube of tin, into one end of which is soldered a solid hemispherical shot which rests on the cartridge in the gun. About half the shot line is coiled in the tube, from which it pays out during flight, the balance of the line being in a can or on a reel placed on the ground or deck. When the gun is discharged, the weight of the line causes the projectile to reverse similar to the Lyle method. The Massachusetts Humane Society uses the Hunt gun, which has a range of more than 700 yards. The rocket, which is the invention of Patrick Cunningham, of the same State, consists essentially in a head carrying the projectile charge, in combination with a tube adapted and arranged to contain a coiled line. The latter is connected with a shore or deck line in the same manner as the Hunt system. This is a powerful rocket having a range of 1000 yards with a small line. It is fired from a stand. Guns, rockets, or mortars, of various designs, are used by all life-saving institutions for effecting line communication with stranded vessels. For other life-saving appliances, see Life-Saving Service.



HUNT GUN AND PROJECTILE.

LIFE-SAVING SERVICE. By Act of Congress approved Jan. 28, 1915, the Life-Saving Service and Revenue Cutter Service were united under the name of the Coast Guard. The union is designed to secure certain advantages of an administrative character affecting both services and to give the field force of the Life-Saving Service the benefits of retirement pensions after a long period of faithful and honorable service, or upon becoming incapacitated through injury or disease incurred in the service. The Coast Guard becomes a part of the military force of the nation and in time of war forms a naval reserve of 4000 men. The organization of the field force of the Life-Saving Service, with its stations, boats, apparatus, and other equipment, as well as its former functions and methods of operation hereinafter described, remain unchanged. The Life-Saving Service of the United States was organized under the present system in 1871. Previously, however, a number of small boathouses had been located on the coasts of Long Island and New Jersey, placed in charge of officers known as keepers, and imperfectly equipped with boats and appliances for the use of such of the coast residents as might volunteer to serve without compensation upon occasions of disaster. The Act of April 20, 1871, gave the Secretary of the Treasury authority to establish additional stations on the coasts of Long Island and New Jersey, and to employ crews of experienced surfmen at such stations and for such periods as he might deem necessary, at a compensation not to exceed $40 per month. Upon this limited authority the inauguration of the existing system was undertaken. Subsequent legislation has extended it to embrace the entire ocean and lake coasts of the United States and has added many improvements. Its purpose primarily is to save life from wrecked or imperiled vessels near the shore by means of organized equipment and effort. Next to the rescue of life is the saving of marine property.

In 1807 the Massachusetts Humane Society, a benevolent organization, placed a lifeboat station at Cohasset, which was the first regular attempt in this country to render direct aid to the shipwrecked from the shore. Later the society built a number of small stations and enlarged materially the scope of its work. The creation and extension of the government service, however, relieved the society of much of its charge, although it still maintains some 43 small houses, equipped with boats and line-carrying guns, on the Massachusetts coast. Between 1848 and 1871 Congress made occasional small appropriations, commencing with one of $10,000 in the former year, for providing means for the rescue of life and property from shipwreck, and under the authority of such fragmentary legislation a number of houses were established along the seaboard furnished with boats and some other life-saving appliances. Lifeboats were also placed at scattered points on the Atlantic and lake coasts. The stations erected had to rely upon volunteers from among the fishermen in the various localities to man the boats and apparatus as occasion required. While there was much of value in this inchoate service, its defects were many and serious. Finally the occurrence of a number of disasters to vessels and their crews on the Atlantic coast, disclosing the inadequacy of the means of succor then at hand, so aroused public sentiment as to cause the enactment of national legislation, upon which the present life-saving system is based. It is the only governmental service, all other life-saving institutions, except one or two small European organizations, being maintained wholly or in part by private contribution.

At the close of the fiscal year which ended June 30, 1914, there were 285 stations included in the service. Of these 203 were situated on the coasts of the Atlantic Ocean and the Gulf of Mexico, 62 on the shores of the Great Lakes, 19 on the Pacific coast, and 1 at the falls of the Ohio River, Louisville, Ky. Eight stations included in this summary were houses of refuge on the eastern coast of Florida. For the convenience of administration, the sea and lake coasts, which have a general extent of about 10,000 miles, exclusive of Alaska, are divided into separate districts numbered from 1 to 13 inclusive. These districts have been fixed with reference to the conformation of the shores, there being 8 on the Atlantic, 1 on the Gulf, 1 on the Pacific, and 3 on the Lakes, one of the last named (the tenth) including the station at the falls of the Ohio River.

The station buildings are located at points of danger to shipping, most of them being at exposed places. Those on the ocean coast are generally two-story wooden structures, built to withstand severe winds and the encroachment of storm tides, and, when conditions permit, are placed sufficiently back of high-water mark to make them safe. The stations on the lakes are similar to those on the seashore. Many of them, however, are located in the vicinity of harbors, behind piers or breakwaters, and are specially devised for the use of the heavy lifeboats employed in that region. The interiors of the buildings are divided into suitable apartments for the accommodation of the crews and the reception of the life-saving appliances, the largest space being allotted to the boatroom, from which a sloping platform leads for the running out of the heavier equipments. Stations exposed to view from offshore are so painted that they can be distinguished a long distance. Each has a lookout tower or platform, where the day watch is kept, and is marked by a flagstaff that may be used in signaling passing vessels. Two stations, the one on the Ohio River and another in Boston harbor, are house boats or floating stations, which are moored in their respective localities and are equipped and manned for their special purposes. The houses of refuge on the coast of Florida are small dwellings, each large enough for the residence of one man, who has charge, and his family. They are supplied with provisions and other necessaries and are intended for places of shelter only, as the character of the neighboring shores makes it possible for wrecked persons to reach the land with little difficulty, their chief danger being from hunger and thirst.

The stations are designated by local names indicating their positions. When they are near each other, some being not more than 4 or 5 miles apart, they are connected with telephone lines, which makes it easy to concentrate two or more crews in combined effort at the scene of wrecks. It often happens that several vessels strand at the same time in the same neighborhood, and for this reason it is desirable to have means to assemble speedily the necessary force to assist them. Whenever practicable, unadjacent stations are connected with the nearest available point that will put them within telegraphic reach. The telephone lines of the service are of value to the commercial interests of the country, as they are used in giving maritime exchanges, underwriters, and others concerned early notice of disasters, and in advising them of the condition of wrecked vessels and their cargoes. During the war with Spain the telephone system was used by the surfmen as a military coast signal service.

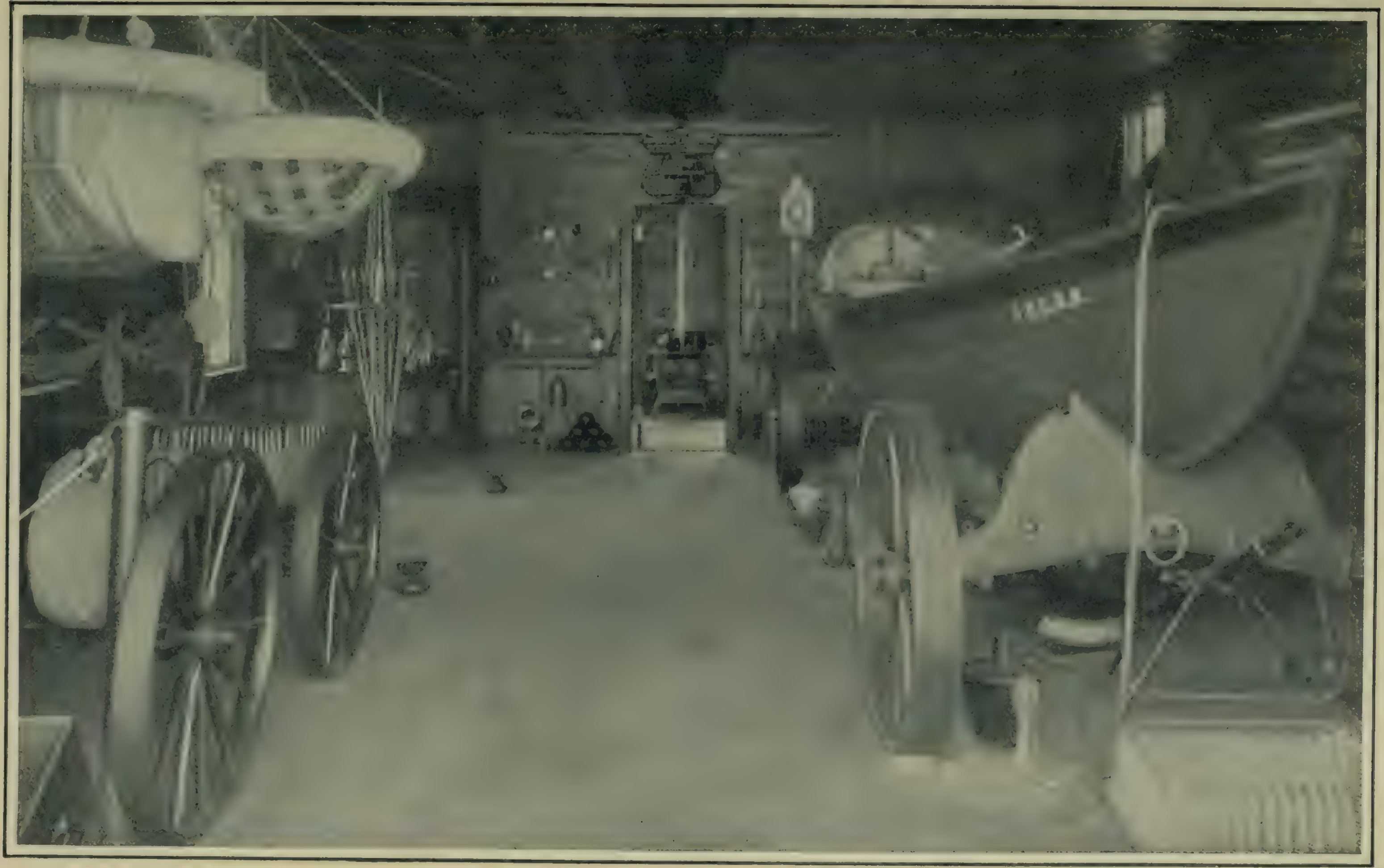
The stations on the Atlantic and Gulf coasts, with the exception of the floating station at Boston, are manned from August 1 to May 31 of each year. In the months of June and July, termed the inactive season, the keepers alone are in charge on those coasts, that being the period least liable to high winds and rough water. The members of the crews, however, who are off duty at that time are required to respond promptly to any call for assistance that may reach them and are paid for services rendered on such an occasion, while volunteers are also relied upon in case it becomes necessary to attend a wreck. Stations on the Pacific coast, and the one at Louisville, are manned continuously, while on the Great Lakes active service covers the interval between the opening and closing of navigation. The floating station in Boston harbor is employed from April 1 to November 30 of each year, its work, like that of the Louisville station, consisting largely in the rescue of imperiled persons from small craft and requiring unremitting vigilance. Its equipment includes a steam launch and two gasoline launches.

A life-saving crew is composed generally of a keeper and from six to eight surfmen, although the number depends a great deal upon the nature of the service they are to perform, in some cases a larger crew being necessary to man a station properly. At most of the stations on the Atlantic coast an extra man is put on during the winter season. A surfman must be a citizen of the United States, not under 18 nor over 40 years of age when originally enlisted, able to read and write the English language, physically sound, a good swimmer, and experienced in the management of boats. Appointments are made upon examination and certification by the Civil Service Commission. Great care is exercised in selecting the men, no one being admitted or promoted to a higher grade who has not furnished manifest proof of his fitness for the position. A vacancy in the keepership of a station is filled by the promotion of a surfman judged to be the most competent available man in the district. There is in each crew a No. 1 surfman—the others being numbered 2, 3, 4, and so on—who ranks next to the keeper and performs that officer's duties in his absence.

The keeper is intrusted with the care of the buildings and their contents and the government of the station. He is the captain of the crew over which he has control. In the boat he takes the steering oar and at other times directs the operations. The crews are put through a rigid course of drills, recitations, and inspections, which the keeper carries out on specified days each week, weather and surf permitting, while the district officers and others in authority make frequent visits to the stations. The drills, which the regulations of the service prescribe, are with the beach apparatus (each station has a drill ground on which is a wreck pole representing the mast of a stranded vessel), surf and life boats, life car, international and general service signal codes, method of resuscitating the apparently drowned, etc. Keepers and surfmen provide themselves with uniforms which they are required to wear at all times when on duty.

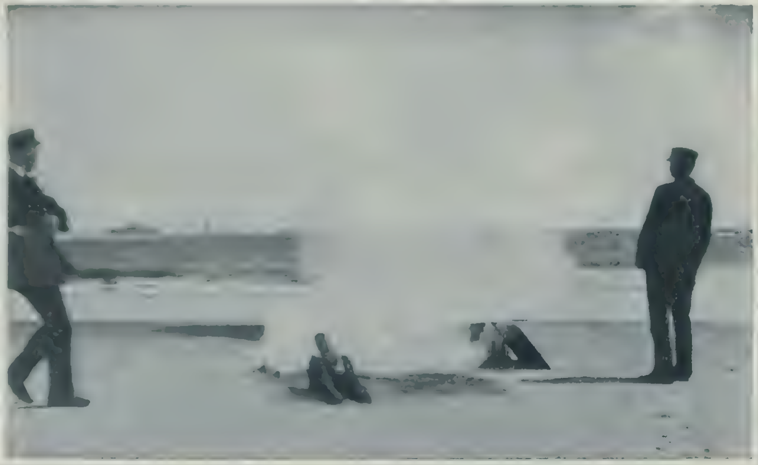
The service uses several principal appliances for saving life from shipwreck. The first of these is the cedar surfboat, which is the boat most suitable to launch from flat beaches through

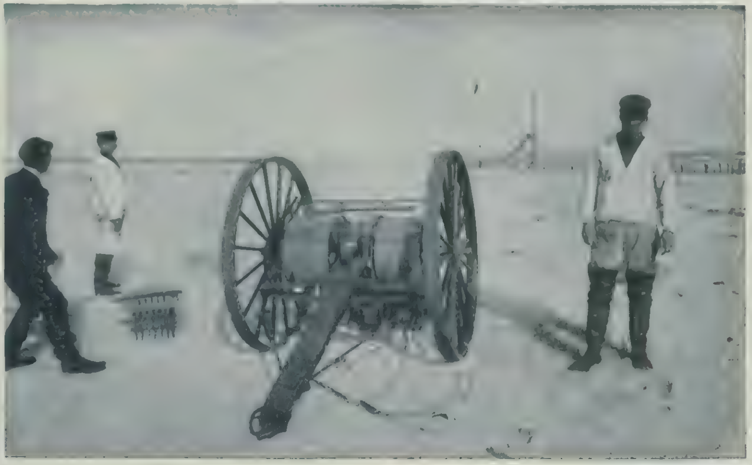
UNITED STATES COAST GUARD

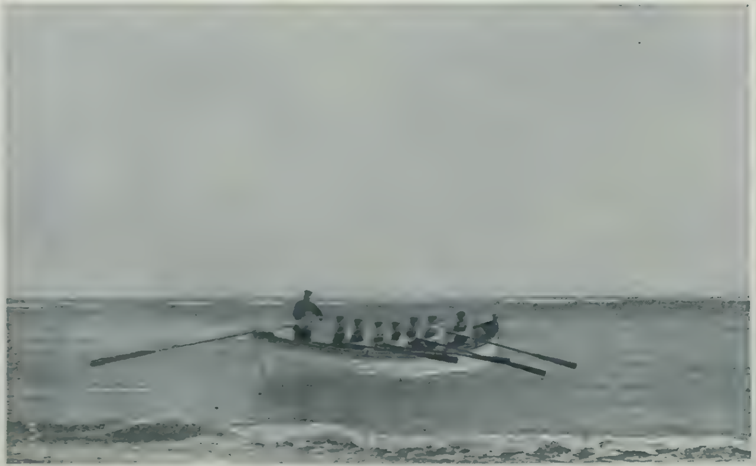


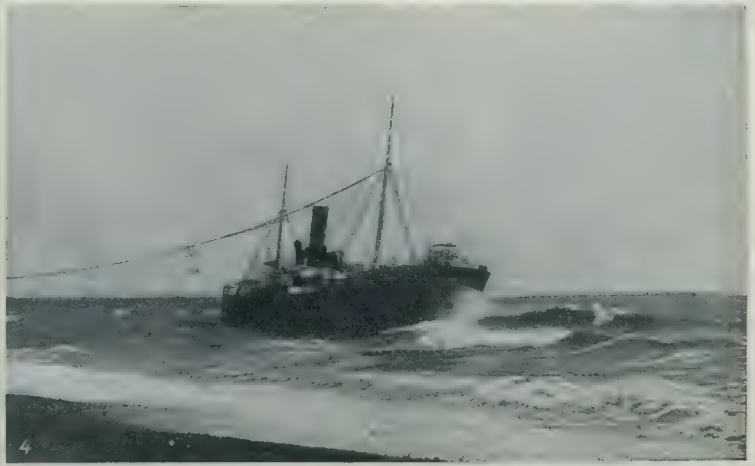
BOAT-ROOM OF A COAST GUARD STATION SHOWING BOAT AND APPARATUS

UNITED STATES COAST GUARD









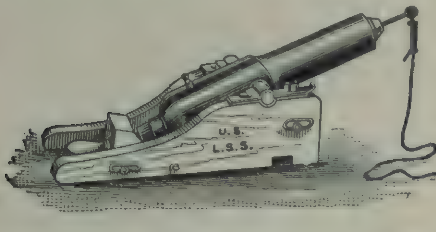
1. Lyle gun being fired
2. Lyle gun on carriage, just after firing — Projectile in the air

3. Beebe-McLellan self-bailing water-ballast surf-boat
4. Rescue with breeches buoy, Cape Ann, Mass.

the shoaling waters of the Atlantic and Gulf coasts. The various types of this boat are developments of the boats used in surfing by the fishermen of Long Island and New Jersey when the first stations were placed on those shores. Those in most general use are from 22 to 27 feet long, 6 to 7 feet beam, and are provided with end air chambers which make them insubmergible. Each is completely equipped with oars, boat hooks, boat hatchets, bailing buckets, life preservers, life and righting lines, cork fenders, an anchor, a canvas drogue, heaving stick, etc. This boat, being comparatively light, can easily be hauled alongshore on its carriage. Its action in the hands of the station crew is often marvelous, the boat being manœuvred in the breakers and in proximity to wrecks with great dexterity. It is propelled by from five to eight oars and is expected to carry, besides the crew, from 9 to 12 persons, although as many as 15 have been safely landed at a time in a bad sea.

Other contrivances are the self-bailing and self-righting lifeboat, a reproduction of the English model, and the Beebe-McLellan self-bailing boat of American design. (See LIFEBOAT.) Lifeboats are used with good effect on the Great Lakes, where the conditions favor their employment, are utilized to some extent at selected points on the ocean coast, and often go long distances under sail. The matter of placing boats at stations has always to be carefully considered, as the type which may be suited to one locality may be entirely unfitted for another.

When it is impracticable to use a boat, wreck ordnance is relied upon for communicating with stranded vessels. A small, bronze, smoothbore gun, weighing with its carriage 185 pounds, invented by Col. David A. Lyle of the United States army, is the appliance in general use. It carries an 18-pound elongated cast-iron projectile, in one end of which is an eyebolt or shank that projects sufficiently beyond the muzzle of the gun to protect the line which is fastened to it from being burned off. When the gun is fired, the strain of the line causes the projectile to reverse. A range of nearly 700 yards, with a small shot line, has been obtained with this gun under favorable circumstances, although the piece is not often called upon to cover a range of more than 400 yards.



LYLE GUN.

The breeches buoy is a circular life preserver of cork, about 7½ feet in circumference, to which short canvas breeches are attached. It holds one person, is suspended by lanyards from a hawser, and is drawn to and from the wreck with lines. On account of its being safe as well as light and easy to transport and handle, and from the further consideration that the greater number of vessels now stranding on the coast have small crews, from 6 to 10, it is more frequently used than the life car.

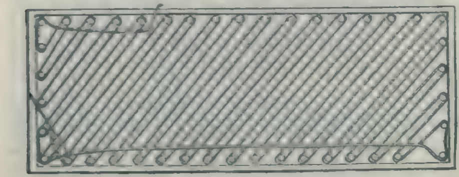
The life car is made of galvanized sheet iron and is shaped like a covered boat with an opening on top, provided with a hatch which may be fastened inside or out. While practically watertight, it has means for supplying air to those within. It is between 10 and 11 feet long, has sufficient capacity for five or six persons, and may be connected with a hawser and hauled in the water to and from a vessel, or can be operated similarly to the breeches buoy. This car has been found very useful in landing sick people and valuables, as they are protected from getting wet.

There are a number of appliances, auxiliary to the principal means of saving life, belonging to the regular outfit of a station. Among these are boat wagons, roller boat skids, apparatus carts, cork jackets, heaving sticks, signal flags, night warning signals, beach torches, patrol lanterns, medicine chests, hawsers, hauling lines, etc. At some points, where the outlying bars are a considerable distance from the shore, powerful line-carrying rockets, which have a greater range than the gun, are kept, but there have been few calls for their use.

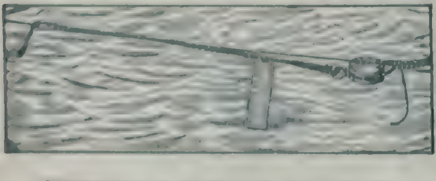
In the day a strict lookout seaward is kept from the stations for distressed craft, and during the night between sunset and dawn, and at all times when the weather is thick and stormy, the patrolmen maintain a steady vigil along the beach. At the beginning of their watch two surfmen from each station follow the shore line in opposite directions until they meet the patrolmen from the adjacent stations, with whom metallic checks, suitably marked, are exchanged and taken to the keepers as proof of the honest performance of duty. When the stations are remote from each other, this scheme, of course, is not practicable, and then the patrolman carries a watchman's clock which can be registered as to time of arrival only by means of a key contained in a post at the limit of his beat. Each man carries, besides a lantern, a night signal which, when exploded by percussion, emits a red flame that flashes far out over the dark waters and warns the unwary ship, approaching too near the breakers and outlying reefs or shoals, of impending danger, or assures the shipwrecked that help is close at hand. The patrol system is a feature that distinguishes the United States service from all others in the world and accounts largely for its unrivaled success in affording relief to seafarers. During the year 1914 198 craft were warned away from dangerous places by the signals of the patrolmen. At some stations, where service is likely to be facilitated by the use of horses, and where the shore is suitable, patrolmen on extended beats are permitted to go mounted.

When the watch, either at night or in the day, discovers a vessel ashore, he takes instant measures to alarm the crew of the station. Sometimes this may be quickly accomplished by use of the telephone in a near-by watch-house; otherwise the surfman must hasten on his errand as best he can. The condition of the weather and surf will indicate to the keeper whether a rescue should be attempted by means of a boat, the breeches buoy, or life car. Either the boat must be hauled on its carriage or the apparatus cart dragged to the scene of the wreck. Draft animals are kept at many stations to facilitate and hasten the transportation of the appliances, but when they are not provided the keeper may hire horses when needed.

If the rescue is to be effected by means of the beach apparatus, no time is lost, after selecting a suitable place abreast of the vessel, in setting up the gear. Each one of the crew proceeds at once to break out the part assigned to his charge and place it in position. The keeper fires the gun, and the slender shot line goes flying over the stranded vessel. This line, to insure its running out without entanglement or friction, has been previously faked over pins, layer upon layer, and inclosed in a box. When brought into use, the box is inverted and the pins are withdrawn, leaving the line disposed in loops so that it will pay out freely. The shot lines are soft-laid and are of three sizes, numbered 4, 7, and 9, being respectively $\frac{4}{32}$, $\frac{7}{32}$, and $\frac{9}{32}$ of an inch in diameter. The sailors on the vessel, with the shot line that has been sent them, haul off an endless rope, rove through a tail-block, called the whip line. If the masts are standing, the tail-block is made fast to the lower mast, well up. The life-saving crew then send off by the whip a 3-inch hawser which is secured to the mast about 2 feet above the tailblock. By means of a strong tackle attached to a sand anchor, consisting of two pieces of flat, stout timber, crossed and bolted, and buried in a trench to support the strain, the surfmen set taut the hawser, passing it over a wooden crotch about 10 feet high which firmly suspends the line between ship and shore. The breeches-buoy block is usually snapped upon the hawser, and the buoy is hauled to and from the wreck with the whip line. Small wooden tablets called tally boards, bearing printed directions in English and French for handling the lines, are attached to the whip and hawser and sent off to the people on the vessel to enable them to coöperate intelligently with the agencies at work for their rescue. In the usual drills at the stations the life-saving crews accomplish the rescue in about five minutes, although it has been made without error in two and one-half minutes. Of course such time cannot be expected in actual service at shipwrecks, where many unfavorable elements conspire to obstruct progress.



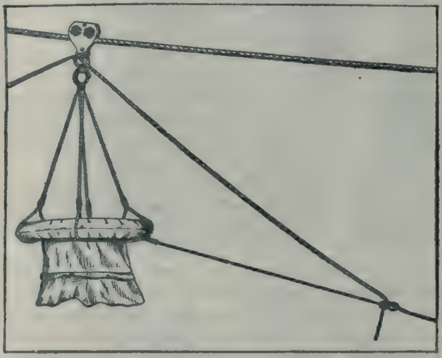
METHOD OF FAKING THE SHOT LINE.



WHIP-LINE TAIL BLOCK AND TALLY BOARD.

The survivors from a wreck within scope of the service are cared for at the station nearest the scene of the occurrence. The victims of marine disaster are often recovered from the water apparently drowned or dead from exposure. In such cases the surfmen attempt restoration by the methods in which they are drilled, their efforts in about half the trials turning out successfully.

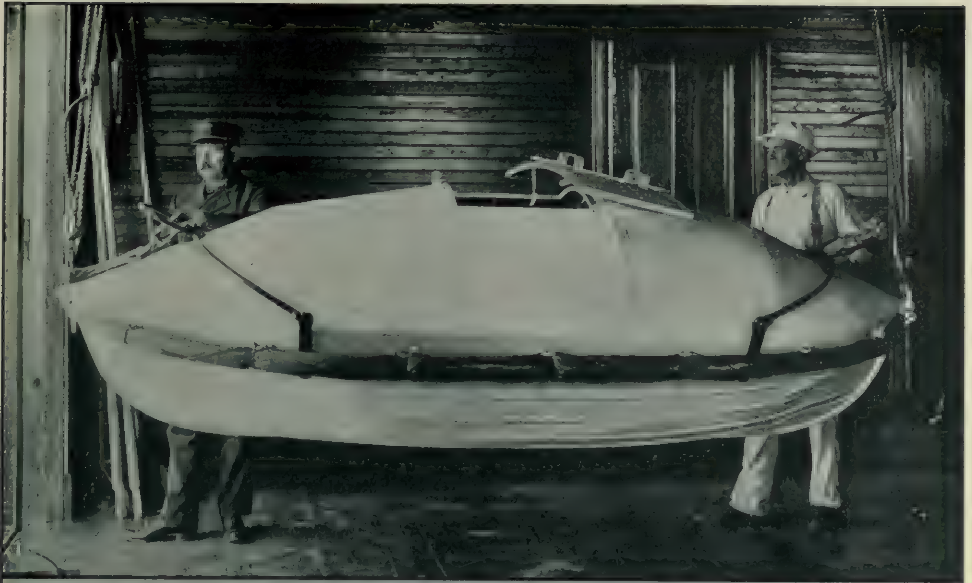
The Life-Saving Service, owing to its relation to commerce, and the assistance it renders in the collection of revenue and the prevention of smuggling, is connected with the Treasury Department. The chief officer in charge is the general superintendent, appointed by the President, the incumbent in 1914 being Sumner I. Kimball, who has been the head of the service since it was established in 1871. The general superintendent is assisted in the performance of his duties by an assistant general superintendent. A captain of the Revenue Cutter Service is detailed as inspector of stations. He personally visits them at stated times and discharges such other duties as the general superintendent directs. The superintendents of construction of life-saving stations are also captains of the Revenue Cutter Service. Each district is under the immediate charge of a superintendent who has been promoted to his position from the ranks of the keepers. His business is to conduct the general affairs of the stations under his supervision, which he visits at least once a quarter, recommend supplies, repairs, etc., pay off the men, inspect public property, fix the patrol limits, after consultation with the resident inspector, certify the names of eligibles for vacancies in the crews, and see that the regulations governing drills and discipline are faithfully fulfilled. The district superintendents and keepers are, under the law, inspectors of customs and as such take care of the government interests in relation to dutiable property wrecked within their jurisdiction. Assistant inspectors for the various districts are obtained from the officers of the Revenue Cutter Service, who periodically inspect the stations, drill the crews, make investigations into the conduct of keepers and surfmen, when such action is necessary, and in cases of shipwreck within the domain of life-saving operations attended with loss of life, and give attention to such other matters as may be assigned them by superior authority.

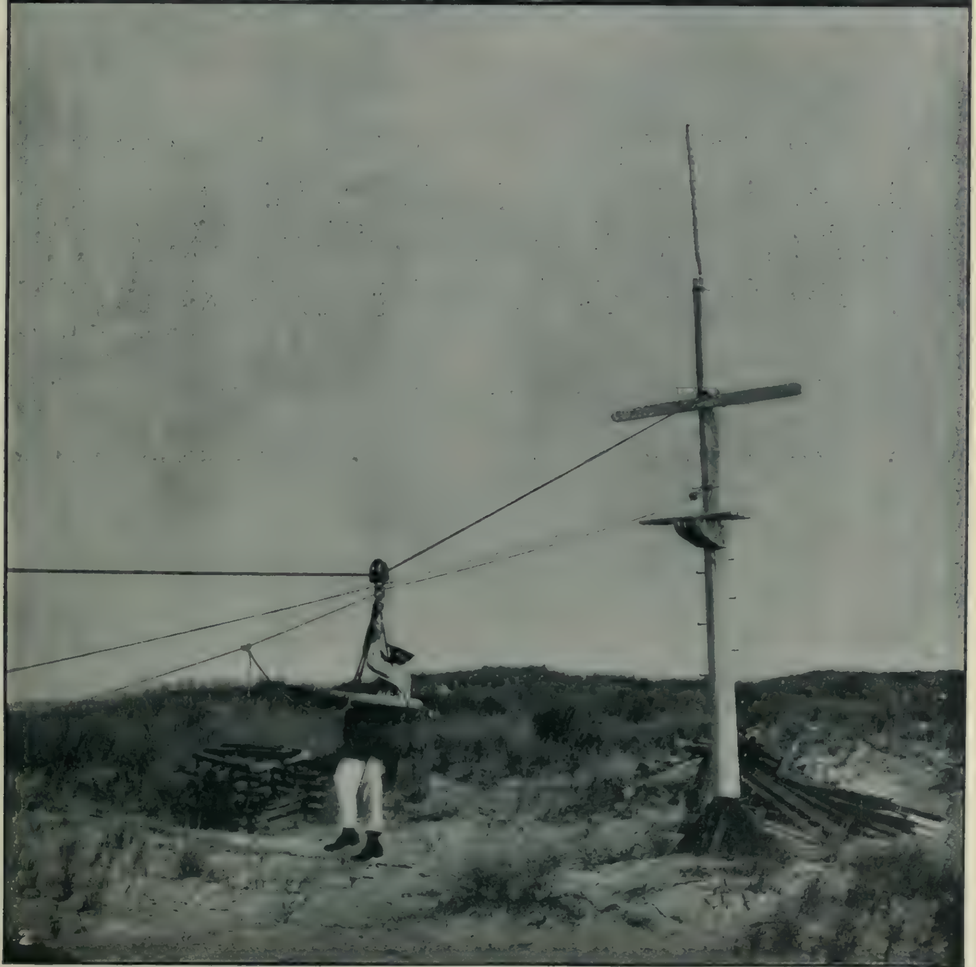


THE BREECHES BUOY.

For the purpose of examining and testing devices, plans, and inventions for the improvement of station equipments, an advisory board is constituted, consisting of experts, which meets annually, as a rule, to consider matters submitted to it by the general superintendent.

Members of crews, including keepers, who become disabled in the line of duty may be continued on the rolls of the service, under pay,

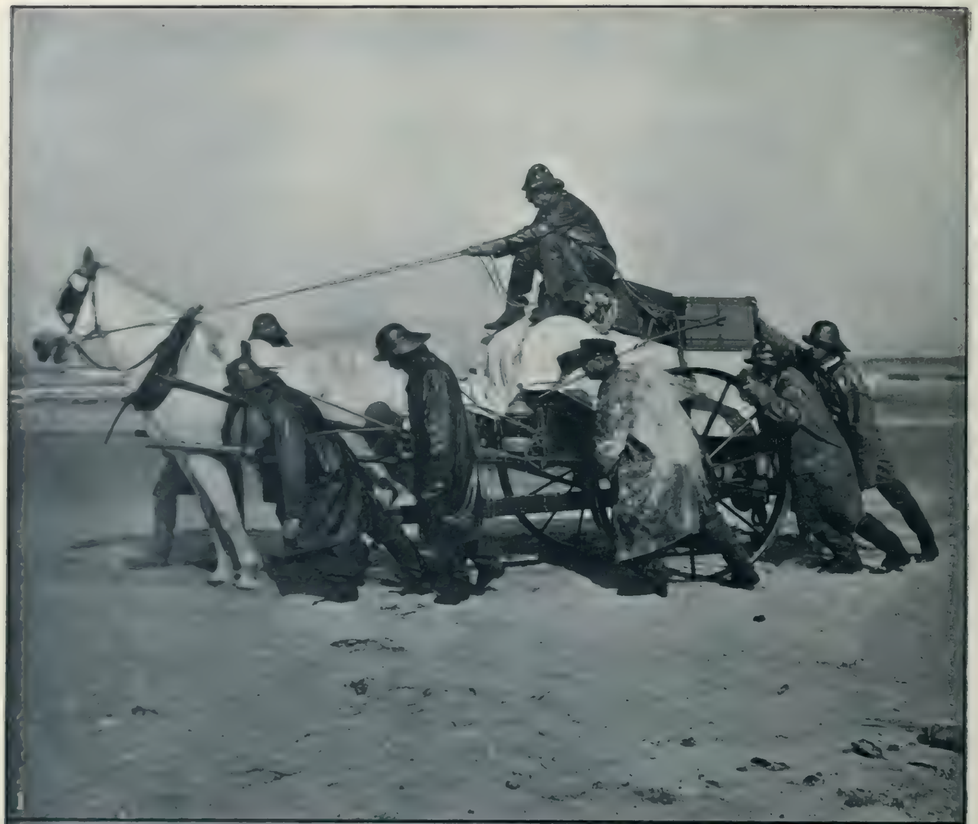


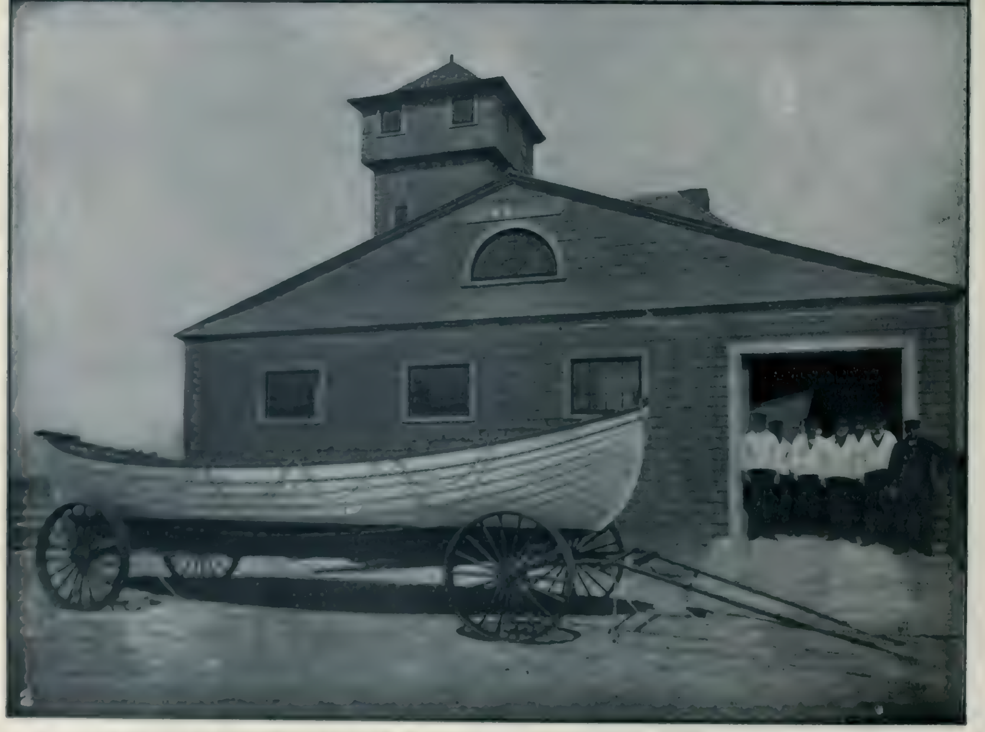


1. THE LIFE-CAR

2. DRILL WITH THE BREECHES BUOY

UNITED STATES COAST GUARD





1 UNITED STATES COAST GUARD CREW AND BEACH APPARATUS EQUIPMENT

2 BEEBE McCLELLAN SURFBOAT ON ITS WAGON. This type of boat is propelled by oars. A typical Coast Guard station is also shown

during the continuance of their disability, not to exceed one year, except in the most meritorious cases, but not longer than two years in any case. In case of their death, from disease or other cause incident to the service, their widows and children under 16 years of age, if they have any, are entitled to receive for two years, in equal portions, the same pay that the husbands or fathers would have received had they lived.

Gold and silver medals are awarded in cases of heroism, where persons endanger their own lives in rescuing or endeavoring to rescue lives from the perils of the sea. These rewards, however, are not confined to the professional life-savers, but may be bestowed upon others who have shown conspicuous heroism on such occasions.

The general superintendent, in accordance with the requirements of an act of Congress, publishes annually a complete report of life-saving operations. Incorporated in this is also a collection of statistics of marine disasters, at home and abroad, put in tabular form for convenient reference, which is of great value to commerce. The net cost of maintaining the service during the fiscal year ending June 30, 1914, was $2,309,317.41. The results of service operations for the same period are as follows:

Number of disasters	1,937
Value of property involved	$21,507,860
Value of property saved	$18,783,200
Value of property lost	$2,724,660
Number of persons involved	9,296
Number of persons lost	38
Number of persons succored at stations	920
Number of days succor afforded	1,234
Number of vessels totally lost	82

EUROPEAN AND OTHER LIFE-SAVING SERVICES

In nearly all maritime countries some organized means exist for assisting the shipwrecked from the shore. These means, with few exceptions, are controlled and supported either wholly or in part by private institutions. China for centuries has had a life-saving service, operated by benevolent societies, which has been mainly directed to rendering aid and preventing casualties on the great waterways of the Empire. The following summary embraces the principal efforts in this direction that have been made in European countries:

Austria. The conditions on the east coast of the Adriatic do not render necessary the maintenance of a regular life-saving service. In case of shipwreck or other marine casualty the health officers of the port or harbor police are required to give the first aid to those in danger and to relieve and take charge of vessels and cargoes. Specially constructed lifeboats, ready for immediate use, are stationed for this purpose at a number of the ports, while steamers and other boats are employed in emergencies.

Belgium. A small service, which was organized in 1838, is maintained by the government. Life-saving stations are scattered along the coast, over an extent of about 400 miles, and these are provided with lifeboats, completely equipped, wreck guns and projectiles, and other apparatus for assisting crews and vessels in distress. The appliances are kept in sheds situated at places accessible to the beach. Medicines and surgical implements are also supplied, a physician being appointed to care for shipwrecked crews.

Denmark. The institutions for the rescue of the shipwrecked are those of North Jutland, Bornholm, and Möen, the expenses of which are defrayed by the government. The service was organized in 1852, but means for the relief of distressed seamen were adopted at certain points on the coast before that time. Lifeboats and rocket apparatus are used and the work is performed by overseers and boatmen, there being some 50 or more stations and substations on the coast of Jutland, where the principal efforts for saving life are directed.

France. The task of maritime life-saving is performed by the Société Centrale de Sauvetage des Naufragés, which was founded in 1865. The organization is somewhat similar to that of Great Britain and is supported mainly by voluntary contributions, the government granting some financial aid. The society has between 400 and 500 stations on the coasts of France and Algeria, and employs more than 2000 persons, most of whom, however, are in the customs service. About one-fifth of the stations are provided with lifeboats. Unlike most of the European services, the French use the gun in preference to the rocket for effecting line communication with vessels, and the statement is made that to M. Ducarne de Blangy should be attributed the credit of having first invented a line-carrying projectile in 1790.

Germany. The entire life-saving service is under the management of the German Society for the Rescue of the Shipwrecked, which was founded in 1865. It is under the patronage of the Emperor and is wholly supported by voluntary contributions, there being more than 100 stations on the coasts of the Baltic and North Sea. About half of them are equipped with both boats and rocket apparatus, the others having boats or rockets only.

Great Britain. Life-saving operations are conducted by the Royal National Lifeboat Institution, which was established in 1824. This organization, which is aided by various local corporations and private parties, provides lifeboats and apparatus for the whole English coast. There were in 1914 274 lifeboat stations under its management. Except a coxswain and an assistant for each boat, who receive annual salaries, the boatmen are volunteers, who are paid for each occasion of service. The rocket service, which embraces a large number of stations, is in charge of the Board of Trade and was organized in 1855. Operations on wrecks are under the supervision of the Coast Guard, which patrols the coast. The English claim that Lieutenant Bell, of the Royal Artillery, first invented, in 1791, a method for projecting a line to a vessel from the shore.

Holland. Two private companies carry on the life-saving operations—one at Amsterdam and the other with headquarters at Rotterdam. The former, which appears to be the more important, is supported by donations from private sources, no assistance being received from the government. The exertions of the company are confined exclusively to the saving of imperiled persons, about 25 stations, provided with lifeboats, being maintained. Fifteen of these have rocket apparatus also.

Italy. The principal life-saving institution is the Società Italiana per provvedere al Soccorso dei Naufraghi, which has its central offices in Rome. It maintains eight lifeboat and two rocket stations. There are besides a number of local societies for alleviating the miseries of the shipwrecked or for resuscitating persons apparently drowned. One of these, the Società Ligure di Salvamento, has 46 huts of refuge.

Russia. The work of rendering assistance to persons in distress on the seas, lakes, and rivers is directed by a society established under the patronage of her Majesty the Empress. It is supported mainly by private benefactions. The business of the society is managed by a principal board located at Petrograd and by a number of district and local boards in various towns and villages. The stations number nearly 1000 of all kinds, including boat and rocket stations, winter stations, substations, places of refuge, lighthouses, posts, etc. The compensation of the life-saving men is determined by the district boards, some of the keepers and crews being paid annual salaries, while others receive remuneration for service and drill only.

Spain. The Spanish Society for Saving the Shipwrecked, with a central board in Madrid, which was reorganized in 1880, has charge of the life-saving service. It receives both government and private gratuities. Its object is to save lives only. Some 50 stations are supported, supplied with boats, line-throwing apparatus, etc., while life-saving appliances of various kinds are kept at many of the lighthouses.

Canada. The Life-Saving Service of Canada was established in 1880 and is supported by the government. The present organization, methods, and equipment are patterned from the United States Life-Saving Service. There were in 1915 between 40 and 50 equipped stations.

Japan. The National Lifeboat Institution of Japan is a voluntary society receiving government assistance. The society was founded in 1889 and is managed by a president, vice president, and council.

Lifeboat and apparatus service is rendered also in the following-named countries by voluntary associations: Turkey, established in 1868; Portugal, established in 1898; Norway, established in 1891; India (east coast); New Zealand; Australia (South). See SAFETY AT SEA.

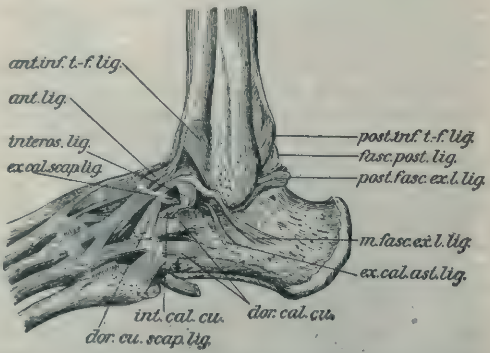
LIFFEY, lĕf′ĭ. A river of Leinster, Ireland, rising in the Wicklow Mountains, 12 miles southwest of Dublin (Map: Ireland, E 5). After a semicircular course of 70 miles, south, west, and northeast, it divides the city of Dublin (q.v.) in two and flows into Dublin Bay on the Irish Sea.

LIG′AMENT (Lat. *ligamentum*, band, from *ligare*, to bind). A cord, band, or membranous expansion of fibrous tissue passing in a fixed direction from one bone to another and serving to limit and control the movements of joints. Ligaments are divided into three classes: (1) *capsular* (Lat. *capsula*, a small box); (2) *fascicular* (Lat. *fascis*, a bundle); and (3) *funicular* (Lat. *funis*, a rope). 1. Capsular ligaments are cylindrical expansions which are attached by their extremities around the margins of the articulating surfaces composing the joint. 2. Fascicular ligaments are flattened bands of various shapes and widths. 3. Funicular ligaments are round on section, and shaped like a heavy cord, as the *ligamentum teres* of the hip joint.

Two ligaments in the body, the *ligamentum subflava* and the *ligamentum nuchæ*, both of which are connected with the spinal column, are composed of yellow elastic tissue. All other ligaments in the body are composed of white fibrous tissue.

The various ligaments result from metamorphosis and retrogression of muscle tissue, with but few exceptions. In a few cases ligaments represent the degenerate remains of cartilage or bone. Capsular ligaments are derived from the periosteum, and are strengthened by the incorporation of tendons of adjacent muscles.

The term "migration of muscles" is applied in myology to an alteration of a point of attachment of a muscle, occurring during tissue changes in low vertebrate forms, whereby a point of origin of a muscle shifts from a position below a joint, e.g., to a position above the joint. The former position of the muscle end is occupied by a ligament under which form part of the muscle tissue persists. An excellent example is the external lateral ligament of the knee joint, which represents the tendon of the *peroneus longus*, this muscle having migrated from the femur to the head of the fibula. See JOINTS. Consult Cunningham, *Text-Book of Anatomy* (New York, 1913).



EXTERNAL VIEW OF THE LIGAMENTS OF THE FOOT AND ANKLE.

Ant.inf.t.-f.lig., antero-inferior tibio-fibular ligament; *ant.lig.*, anterior ligament of ankle joint; *interos.lig.*, outer extremity of the interosseous ligament; *ex.cal.scap.lig.*, external calcaneo-scaphoid ligament; *post.inf.t.-f.lig.*, postero-inferior tibio-fibular ligament; *fasc.post.lig.*, fasciculus of posterior ligament of ankle; *post.fasc.ex.l.lig.*, posterior fasciculus of external lateral ligament; *m.fasc.ex.l.lig.*, middle fasciculus of external lateral ligament of ankle; *ex.cal.ast.lig.*, external calcaneo-astragaloid ligament; *dor.cu.scap.lig.*, dorsal cubo-scaphoid ligament; *int.cal.cu.*, internal calcaneo-cuboid; *dor.cal.cu.*, dorsal calcaneo-cuboid.

LIGAMENT, IN COMPARATIVE ANATOMY. The presence of true ligaments among invertebrates is doubtful, unless we include under the term all strands of connective tissue which serve to bind one part to another, such as that in the hinge of bivalved mollusks. This band is composed of two layers, of which the inner is very elastic, and has somewhat the appearance of cartilage. See PELECYPODA.

Among vertebrates ligaments are found of great variety of form and function, especially among birds and mammals. Of these, one which is but slightly developed in man, though largely developed in the gorilla, deserves a brief description. This is the *ligamentum nuchæ* or neck ligament, which assists in the support of the head in long-necked ungulates, as the horse, camel, and ox. It is composed of yellow, elastic, fibrous tissue and is associated with a remarkable development of the neural spines of the anterior thoracic vertebræ, to which its posterior end is attached. The anterior end is connected with the base of the skull and some of the anterior cervical vertebræ. This ligament is well known to butchers, by whom it is called paxwax or faxwax. A similar ligament is present in most other mammals, but does not reach such a high development. The ligament whose function it is to operate the elevated sheathed claws of cats will be found explained and illustrated under Cat.

LIGAMENTUM NUCHÆ. See Neck.

LI′GAN, or LA′GAN. In English and American law, goods cast overboard to lighten a ship in danger of destruction by storm or of capture by pirates and which are attached to a buoy so as to make recovery possible. Such goods are not technically wreck and so do not fall within the operation of the peculiar rule which, under certain circumstances, involved a forfeiture of wrecked property to the crown. See Flotsam; Jetsam; Wreck.

LIGAO, lē-gä′ō. A town of Luzon, Philippines, in the Province of Albay (Map: Philippine Islands, D 4). It is situated on the main road of the province, about 22 miles west-northwest of Albay, in the midst of a large hemp-growing district. Pop., 1903, 17,687.

LIG′ATURE (Lat. *ligatura*, band, from *ligare*, to bind). A thread of silk, catgut, or other material, tied around a blood vessel to arrest hemorrhage or to diminish the flow of blood to an aneurism or tumor. While a distinction is made between ligature and suture, the latter term designating strands used for sewing or stitching, the same materials are employed for both purposes. The use of ligatures was known many centuries ago, the old Roman surgeons using them with considerable skill. During the Dark Ages they were forgotten, and it was not until Ambroise Paré (q.v.) introduced them (about 1536), while in Italy with the army of René de Mont-Jean, that their use was slowly revived. Up to this time hemorrhage from wounds was stopped by searing them with red-hot irons or plunging the part in hot pitch. John Hunter, an English surgeon, first advocated the ligature in the treatment of aneurisms by tying off the artery at some distance from the aneurismal sac. The materials from which ligatures have been made are very numerous. Those in most common use are silk, catgut, and silkworm gut, but kangaroo tendon, linen, hemp, ox aorta, horsehair, dentists' floss, fine wire, and other materials are utilized. Catgut, like most animal substances, is quickly absorbed by the tissues and is used for buried ligatures. Silk is not absorbed, but has the advantage of being much stronger than catgut (and therefore more suitable for delicate work) and more easily sterilized. Silver wire is useful where considerable masses of tissue have to be included in the ligation.

Ligatures are employed for arresting hemorrhage in arteries or veins either at the time of an amputation or other operation in which a vessel is divided, or when an artery is wounded accidentally; for removing tumors of various kinds such as hemorrhoids; for diminishing the supply of blood to a part, as in the case of inoperable malignant tumors, whose growth may be sometimes temporarily arrested by cutting off their circulation, and for bringing about a cessation of blood flow through an aneurism.

The usefulness of the ligature depends upon the fact that when the internal coat of an artery is torn off or injured, the blood clots, the fluidity of the blood depending upon the integrity of this coat. Ligatures are therefore applied with sufficient force to rupture the internal and middle coats and constrict firmly the outer coat of the artery. Clotting takes place as far as the nearest branch, and this portion of the vessel is ultimately converted into a fibrous cord. Injured arteries of any size are tied on both sides of the wound to prevent possible recurrent hemorrhage from connecting branches. When the injured point is not accessible the ligature is sometimes placed at a distance from the wound.

In the treatment of aneurisms, the ligature is placed upon the artery, when possible, between the heart and the sac, and at some distance from the aneurism, for the reason that the artery in the vicinity of the aneurism is too diseased to resist being cut through by a ligature. This operation was devised by Hunter. Brasdor afterward conceived the idea of tying on the distal side of the aneurism; a barrier to the blood current is just as effectively formed, collateral branches above the aneurism enlarge, the blood is diverted and a clot forms in the aneurismal sac. Another device is that of Wardrop, which consists in tying one of the branches of the artery below the aneurism.

The important operations in arterial ligature are those involving the subclavian, innominate, carotid, and iliac arteries, and the abdominal aorta. The latter vessel has been tied on nine or ten occasions and the operation has always resulted fatally. It was first performed by Sir Astley Cooper in 1817, the patient surviving 48 hours; in 1902 a case operated on by Keen, an American surgeon, survived 48 days. These operations are done only in cases of desperate need, either in the event of an aneurism about to rupture or alarming hemorrhage from penetrating wounds. See Aneurism; Circulation; Brasdor's Operation.

LIGATURE. In music, a slur or tie, hence a term which indicates that a group or series of notes is to be executed coherently; if in vocal music, that they are to be sung with one breath. The term is used in instrumental music to mark the phrasing. In mensurable music ligature denotes a group of notes that are to be executed on one syllable. See Mensurable Music.

LIGER. See Loire.

LIGHT (AS. *lēoht*, Goth. *liuhap*, OHG. *lioht*, Ger. *Licht;* connected with Lat. *lucere*, to be bright, Gk. λευκός, *leukos*, bright, Ir. *loche*, lightning, OChurch Slav. *lucha*, beam of light, Skt. *ruc*, to shine). The sensation of which one becomes conscious through the optic nerves. In general the cause of this sensation is the entrance into the eye of ether waves whose wave numbers lie between certain limits; and therefore such unscientific expressions as "light enters the eye," "light waves," etc., are often used. From the standpoint of physics one is concerned with the problem of the production of these ether waves, their propagation and their entrance into the eye; after reaching the retina their further action becomes the study of physiology.

Any proper physical explanation of light must show that all the phenomena of ether waves both in the pure ether and inside material bodies may be deduced from certain dynamical equations, and with our present knowledge of matter and the ether this can be done with a fair degree of satisfaction. There are, however, many phenomena which do not require for the explanation of their main features any exact knowledge of the properties of ether and matter, but which may be referred to certain general mechanical principles. Thus, the most important phenomena of interference and diffraction may be explained by the general principles of wave motion; and the most striking features of lenses, mirrors, and prisms may be shown to follow from the treatment of rays of light, assuming the laws for reflection and refraction of rays.

That portion of the subject of light which may be explained by the use of the idea of rays is called Geometrical Optics; that portion which uses the idea of wave motion is called Physical Optics; and the complete treatment which explains the laws of rays and of waves and connects all the phenomena of dispersion, reflection, magnetic rotation, etc., by one set of dynamical equations is called the Dynamical Theory of Light.

HISTORICAL SKETCH

Geometrical optics is not entirely a modern science, for the Greeks and their disciples the Arabs were acquainted with the law of reflection and its more immediate consequences. Aristotle, Euclid, Archimedes, Hero, and Ptolemy knew that light was transmitted in straight lines; but with the important exception of Aristotle and some of his followers the ancient philosophers believed that rays proceeded *from* the eye *to* the object, instead of in the contrary direction. Ptolemy was well acquainted with atmospheric refraction. Alhazen (early part of eleventh century) and Vitellio the Pole (1260) were almost the only students of this science during the Middle Ages, and their additions to it were unimportant. The lens, though known from early antiquity, was not applied as an aid to defective eyesight till after the time of Roger Bacon. Jansen, Metius, and Galileo separately invented the telescope (q.v.) about the beginning of the seventeenth century; and with it the last-mentioned philosopher (see GALILEO) made various important astronomical discoveries. Kepler, shortly after, gave the true theory of the telescope, explained the method of finding the focal length of lenses, and applied it to find the magnifying power of the telescope, besides pointing out the mode of constructing an instrument better adapted for astronomical purposes than that of Galileo; he also made some useful experiments on the nature of colors, and showed that images formed on the retina of the eye are inverted, a fact previously discovered by Maurolycus of Messina. From this period the science of optics steadily advanced through the labors of De Dominis, Snell (the discoverer of the law of refraction in 1621), Descartes, Fermat, Barrow, Mariotte, and Boyle. Up to the time of Newton it was generally believed that color was produced by refraction, but he showed by a beautiful series of experiments that refraction only separates the colors already existing in white light. In his hands the theory and construction of the telescope underwent many valuable improvements, and in 1672 the description of his reflecting telescope was submitted to the Royal Society. Gregory had constructed an instrument on similar principles some years before. About the same time Grimaldi made his interesting series of experiments on diffraction, and noticed the remarkable fact of the interference of one pencil of light with the action of another.

To explain the phenomenon of sharp shadows Newton advanced his corpuscular theory of light, the idea of which was that light is due to the emission of streams of fine particles from the source of light. To explain refraction on this theory it was necessary to assume that the velocity of light is less in air than in glass or water. Using this theory, Newton tried to explain diffraction and the colors of thin plates; but the hypotheses involved in the explanation were too involved to be satisfactory. The important services of the ingenious but eccentric Hooke cannot be easily stated in a few words, as he discovered a little of everything, completed nothing, and occupied himself to a large extent in combating faulty points in the theories of his contemporaries. It must not, however, be forgotten that he has as much right as Huygens to the credit of originating the undulatory theory, though Hooke made little more than a lucky guess, while Huygens gave a remarkable discussion of the application of the theory to reflection and refraction. Newton's corpuscular theory was, however, the accepted one until the work of Young and Fresnel. The double refraction of Iceland spar was discovered (1669) by Bartholin, and fully explained in 1690 by Huygens. The velocity of light was discovered by Roemer (1675), and in 1720 the aberration of the fixed stars and its cause were made known by Bradley, who likewise determined with accuracy the amount of atmospheric refraction. The fact that the two rays produced by Iceland spar were polarized was known to Huygens; but polarization by reflection was not known until discovered by Malus in 1808. The properties of polarization were then investigated by Brewster, Biot, and especially by Arago.

The proof that light is due to wave motion was first given by Dr. Thomas Young, who published his work on interference in 1801. The difficulty of accounting for polarization phenomena by the theory of waves was first met by Fresnel, who proposed the idea that the ether waves are transverse, and showed how this hypothesis perfectly explained the observations. It is to Fresnel also that we owe the explanation of rectilinear propagation and of diffraction. The attempt made by Fresnel to give a dynamical theory of light was not successful, although he did deduce formulæ for reflection, refraction, and total reflection which are in good accord with experiment. Green, Lord Kelvin, Helmholtz, Stokes, Rayleigh, and more recently Poincaré, Larmor, and Lorentz, have advanced dynamical theories with more or less success; the theory of Lorentz based on the motion of electrons is most satisfactory.

GEOMETRICAL OPTICS

It is assumed in this subject—as the result either of direct experiments or of deduction from physical optics—that rays of light pass in straight lines through any homogeneous medium; that they are independent of each other; that when a ray meets a surface separating two transparent material media, e.g., water and air, it produces a reflected ray back into the first medium and a refracted ray in the second medium, the two having definite directions given by the laws of reflection and refraction. The laws of reflection are: If a tangent plane is drawn to the separating surface at the point where the ray strikes, the line perpendicular to this plane at the point bisects the angle between the incident and reflected rays and lies in the plane which includes them. The laws of ordinary refraction are: If a tangent plane is drawn to the separating surface at the point where the ray strikes and if a perpendicular line to this plane is drawn through this point, it will lie in the plane including the incident and refracted rays; and if the angles between these rays and the perpendicular line are θ_1 and θ_2, the ratio of sin θ_1 to sin θ_2 is a constant for the two media for a given kind of light. This ratio is called the index of refraction of the second medium with reference to the first; it is found to vary for light of different colors. If the first medium is the pure ether, this ratio is called the index of refraction of the second medium.

There are certain bodies—either crystal or isotropic bodies in a state of strain—such that when an incident ray falls upon them, not one but in general *two* refracted rays are produced. This is called double refraction. In one class of bodies one of the refracted rays obeys the ordinary laws of refraction and is called the ordinary ray, while the other ray does not in general do so and is called the extraordinary ray. In other bodies neither of the refracted rays obeys the ordinary laws in general. The main features of bodies of the former class, e.g., Iceland spar, were fully explained by Huygens on the wave theory, while those of the latter class, e.g., aragonite, were explained similarly by Fresnel. See section on *Physical Optics* below.

Shadows. If rays pass in straight lines, the main phenomena of shadows are at once explained. A small source of light, a point source, will cast sharp shadows of any opaque object which stops the rays. If the source of light is large, like a window, there will be certain points in the shadow of an opaque object, close to the object, which are not reached by any rays, there will also be points which are reached by rays from part of the source only, and then there will be points which receive rays from the whole source. Those points which do not receive any rays lie in the umbra or shadow proper, while those which receive rays from only a portion of the source lie in the penumbra. Thus, an eclipse of the sun by the moon is *total* at a point of the earth's surface which passes through the shadow cast out into space by the moon obscuring the sun's rays; it is called *partial* at a point on the earth if that point passes through the penumbra only; it is called *annular* if at any time during the eclipse there can be seen a ring of the sun's surface extending past the moon's disk. Pinhole photography is another phenomenon which follows at once from the passage of rays in straight lines.

Reflection. If rays from a point source fall upon a reflecting surface, each ray individually will obey the laws of reflection. If the incident rays form a small solid cone symmetrical about the line drawn through the point source and perpendicular to the surface, they are said to form a homocentric pencil; if, however, the axis of the cone of rays is oblique to the surface, it is called an astigmatic pencil. The rays forming a homocentric pencil after reflection form another such pencil, i.e., they either *converge* to a point on the perpendicular to the surface or *diverge* in such a manner that if the rays be produced back of the surface they will meet in a point on the perpendicular to the surface. This vertex of the cone of reflected rays is called the focus or image of the point source: it is a real focus or image in the former of the above cases; virtual, in the latter. The rays forming an astigmatic pencil after reflection do not in general have a point focus or image, but have as foci two short straight lines at right angles to each other and a short distance apart: they are called focal lines, and may be either real or virtual. A few special cases will be discussed briefly.

Plane Surface.—Let *PM* be the section made by the paper of a plane surface perpendicular to the paper; let *O* be the point source; *OMO'*, the perpendicular dropped from *O* upon the surface; *OP*, any incident ray; *PQ*, the reflected ray; *SP*, a perpendicular to the surface at *P*; *PO'*, the continuation of *QP* backward. By the laws of reflection the angles *OPS* and *QPS* are equal. Therefore by the laws of geometry the point *O'* is at a distance *O'M* back of the surface equal to that of the point *O* in front of it; and further the position of *O'* is entirely independent of the direction of the ray *OP*, and is therefore the same for all rays. Consequently, all rays diverging from *O*, both homocentric and astigmatic pencils, proceed after reflection at the surface as if they had come originally from the direction of *O'*. *O'* is therefore the virtual image of *O*. Similarly if an extended object is emitting light towards a plane mirror each point of the object will have a virtual image in the surface at the same distance behind it as it itself is in front of the surface. There will thus be a virtual image of the object of the same size.

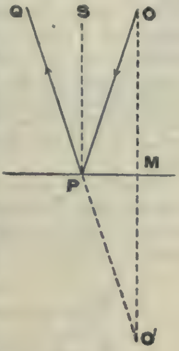


FIG. 1.

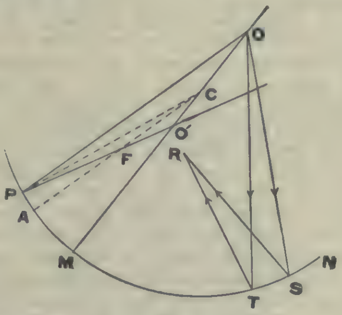


FIG. 2.

Spherical Surface.—Let *PMN* be the section made by the paper of the concave spherical surface; *O*, the point source of light; *C*, the centre of the sphere of which the surface is part; *OCM*, the perpendicular to the mirror (i.e., the axis for the point *O*); *OP*, any ray of a homocentric pencil; *CP*, the radius of the sphere drawn to *P*, and therefore perpendicular to the surface at *P*; *PFO'*, the reflected ray; *CFA*, a line drawn through *C* parallel to the ray *OP*. By the laws of reflection the angles *OPC* and *O'PC* are equal; then by ordinary laws of geometry the point *F* where the reflected ray O'_2P intersects the radius *CA* divides this radius in two equal parts, and the position of the point *O'* on the line *OCM* is independent of the incident ray provided that *P* is near *M*. Therefore all the rays of a homocentric pencil from *O* form another homocentric pencil on reflection with its vertex at *O'*: this point is therefore a real focus or image of *O*. If the distances *OM*, *O'M*, *CM*, are called u, v, r respectively, they are connected by the formula

$$\frac{1}{u}+\frac{1}{v}=\frac{2}{r}.$$

This formula can be shown to apply to any position of the point O and to either a concave or a convex mirror, provided only that the pencil of rays is homocentric.

Let OS and OT be two rays of an astigmatic pencil, and let SR and TR be their reflected rays. They intersect in a point R not on the axis. If a small pencil of rays is considered as falling on an elementary area of the mirror near T and S, the reflected rays will combine to produce a line perpendicular to the paper at R and another line lying in the paper across the axis; these are the two focal lines, real in this case.

If all the rays falling on the whole concave mirror are considered, they will form by reflection a bright point at the focus O', which is the apex of a bright curved surface made up of the focal lines such as was produced at R owing to an elementary area of the mirror. This pointed surface is called the caustic surface. A section of such a caustic formed by reflection at a cylindrical mirror is often seen on the surface of a glass of milk or a cup of coffee. The fact that astigmatic pencils do not bring the rays to the same focus as that of the homocentric pencil is said to be due to spherical aberration.

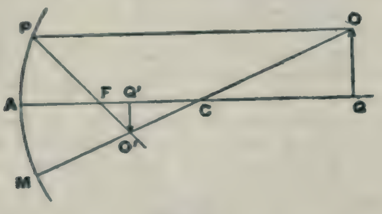


Fig. 3.

If any small object OQ is placed in front of a concave mirror, as shown, its image will be $O'Q'$, as is evident from the figure. The image is therefore real, inverted, and diminished in size, if the object itself is further from the mirror than the centre C. If the object is between the mirror and its principal focus F (which lies halfway from the centre to the mirror), the image is a magnified virtual one. The linear size of the image divided by that of the object equals $\frac{r-v}{u-r}$.

The case of a convex spherical mirror may be treated in the same manner, and the same formulæ will be found to apply, proper attention being given the algebraic signs of u and v.

Refraction. One must distinguish between homocentric and astigmatic pencils in refraction as well as in reflection; for a homocentric pencil of incident rays produces a homocentric pencil of refracted rays, thus giving a point focus, either real or virtual; and an astigmatic pencil produces, as before, two focal lines at right angles to each other. It should be observed, further, that the index of refraction—and hence the direction of the refracted rays and the positions of the foci—differs for different colors of the light. Light of a definite index of refraction is called light of a pure color, or homogeneous light. The indices of refraction with reference to air and for the mean wave length of white light are given for a few substances in the following table:

Alcohol, 1.36
Glass, soft, 1.52
Glass, hard, 1.66
Water, 1.34

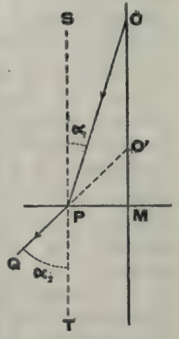


Fig. 4.

Several special cases of refraction will be considered.

Plane Surface.—Let PM be the section of the plane surface by the paper which is perpendicular to it; let O be a point source of homogeneous light forming a homocentric pencil, of which OP is one of the rays and OM is the axis; let PQ be the refracted ray; SPT be perpendicular to the surface at P; O' be the intersection of the line OM with the prolongation backward of the refracted ray. Call the angles SPO and TPQ α_1 and α_2 respectively. By the laws of refraction $\frac{\sin \alpha_1}{\sin \alpha_2}$ is a constant; call it n: then by ordinary geometry it can be proved that $O'M = nOM$. O' is therefore independent of the direction of the incident ray OP and is the vertex of the refracted homocentric pencil, being a virtual image of O. The diagram is drawn for a case where $n < 1$, e.g., rays emerging into the air from a bright point below the surface of water. If rays emerging from a bright point in air were entering water, $n > 1$ and O' is farther from the surface than O. If light of a different color had been used, i.e., of a different value for n, O' would have had a different position on the line OM. Thus, if light of different colors is emitted from O, there will be a series of colored images along OM. This fact that rays of different colors have different images is said to be due to chromatic aberration. Experiments show that in the case of air and glass, or air and water, blue light is refracted more than green, green more than yellow, yellow more than red; or, as a general statement, shorter waves are refracted more than longer ones.

A pencil of rays incident obliquely on the plane surface is astigmatic and has two virtual focal lines. If in the above diagram the incident ray OP is so oblique that the refracted ray PQ just grazes the surfaces, $\alpha_2 = 90°$, and therefore $\sin \alpha_2 = 1$. Hence $\sin \alpha_1 = n$, or $\alpha_1 = \sin^{-1} n$. If then there should be a ray more oblique than this value of α_1, it would be totally *reflected*, and there would be no refracted ray. This limiting value of the angle of incidence—$\sin^{-1} n$—beyond which all rays are totally reflected is called the *critical angle* for the two given media separated by the surface and for the particular kind of light for which the index of refraction is n.

Plate.—A portion of transparent matter bounded by two plane parallel faces forms a plate. A ray in passing through it from the medium on one side out into the same medium on the other side does not have its direction changed although the emerging ray is displaced sidewise.

Prism.—A portion of transparent matter part of whose bounding surface is two plane faces oblique to each other forms a prism. The line in which these two planes meet (or would meet if prolonged) is called the edge of the prism. Let the paper make a section of the prism perpendicular to its edge, as in the figure. Let the index of refraction of the material of the prism with reference to the surrounding medium be greater than 1; then the path of an incident ray *OP* will be as shown *OP* — *PQ* — *QR*, the angles of refraction being such as to satisfy the laws of refraction. The direction of the incident ray is *OPV*; that of the emerging ray, *WVQR*; so the change in direction, or the *deviation*, is the angle *PVW*. This deviation is a function of the index of refraction and therefore of the color of the light; so if there are two incident rays of different color along *OP* they will have different deviations and on emerging from the prism will be dispersed. It should be noted, however, that prisms of different material, e.g., different kinds of glass, disperse the same colors to different amounts; this is called irrationality of dispersion; and it is owing to this fact that achromatic lenses and prisms are possible. (See ACHROMATISM.) This phenomenon of dispersion may be expressed differently. If *O* is the source of a pencil of rays, it will have a virtual image owing to refraction at the first surface of the prism; the rays diverging from this image will have a virtual image owing to their refraction at the second surface; so the emerging rays will seem to come from a virtual source on the same side of the prism as *O*, the actual source. The position of this virtual source varies with the index of refraction of the rays; and different colors will have different virtual sources. So, if *O* is a source of rays of different colors, there will be a series of virtual sources, one for each color. If the prism is glass and the surrounding medium air, the virtual image of blue light will be closer to the edge of the prism than that of green light, and this is closer than that of red, referring to Fig. 5. This shows that the index of refraction *n* for glass with reference to air is greater for blue than for green, and the index for green greater than that for red.

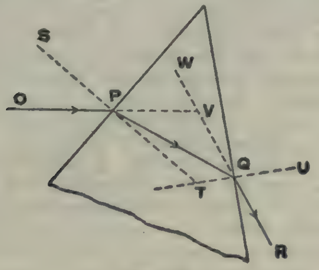


FIG. 5.

It should be noted that in the case shown in the figure, if *OP* is the central ray of a cone of rays, they form an astigmatic pencil; and so the virtual source is not really a point, but two focal lines. It may be proved that for one particular direction of the incident ray *OP*, these two focal lines, due to two refractions, cross at a point and thus give practically a point for the virtual source. This direction is such that the incident and emerging rays, *OP* and *QR*, make equal angles with their respective faces of the prism. For this ray, too, it may be shown that the deviation is less than for all the other rays from the source *O*; and it is called the angle of minimum deviation.

A prism offers one of the simplest and best methods for the measurement of the index of refraction with reference to air of a given material for definite colors. It may be proved that if *A* is the angle between the two faces of the prism and *D* the angle of minimum deviation for rays of a definite color—both measurable quantities—the index of refraction of the material of the prism for this color is given by the formula

$$n = \frac{\sin\frac{A+D}{2}}{\sin\frac{A}{2}}.$$

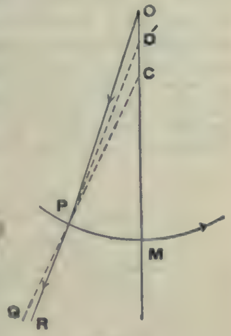


FIG. 6.

It is found for all ordinary transparent bodies such as different kinds of glass, water, etc., that as the color is changed from red to yellow, to green, to blue, etc., the index of refraction increases. In some bodies this is not so (e.g., green may be refracted less than yellow); they are said to exhibit anomalous dispersion.

Spherical Surfaces.—Let *PM* be the section of the spherical surface separating two transparent media; let *C* be the centre of this sphere; *O* be the source of a homocentric pencil, of which *OP* is one ray, and for which *n* is the index of refraction; let *CPQ* be a perpendicular to the surface at *P* and *PR* be the refracted ray, whose prolongation backward is *PO'*. As before, $\frac{\sin a_1}{\sin a_2} = n$, and by geometry it may be shown that *O'* is the virtual image of *O*, where *O'* lies on the line *OCM* which passes through the centre of the spherical surface, and the distance *O'M* is such that

$$\frac{n}{O'M} = \frac{1}{OM} + \frac{n-1}{CM}.$$

This same formula may be shown to apply to both convex and concave surfaces.

Lenses. A portion of transparent matter bounded by two spherical surfaces and symmetrical about the line joining their centres is called a lens; this line of symmetry is called the axis. A homocentric pencil of homogeneous rays from any point on the axis gives rise after two refractions to another homocentric pencil with its vertex on the axis. If the source of rays is *O*, at a distance *u* from a thin lens, the image *O'* will be at a distance *v* on the opposite side of the lens, where *u* and *v* are connected by the relation

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f},$$

f being a constant depending on the radii of the two surfaces of the lens and its index of refraction for the particular rays. *O* and *O'* are conjugate foci. If *O'* is the real image of *O*, then *O* will be the image of *O'* as a source of rays. (If in this formula, on substituting for *u* and *f* their values, *v* is a negative quantity, *O'* is on the same side of the lens as *O*.) There are two classes of lenses; for one, *f* is a positive number; and for the other, *f* is negative.

1. *f* is essentially positive.—As a special case let *O* be at an infinite distance, i.e., $u = \infty$ and all the rays from *O* are lines parallel to the axis. Therefore $v = f$, a positive quantity; and *O′* is on the opposite side of the lens at a distance *f*. This point is called the principal focus on that side; and all rays on the other side parallel to the axis pass through this focus after refraction through the lens; for this reason a lens of this kind is called a converging one. Similarly, if $u = f$, $v = \infty$; i.e., all rays passing through a point on the axis at a distance *f* from the lens emerge on the other side of the lens parallel to the axis. There are thus two principal foci at equal distances from the lens on its two sides. Again, any ray through the point where the axis cuts the lens has its direction unaltered, because at this point, which is called the centre of the lens, the two surfaces of the lens are parallel and close together, assuming that the lens is thin. These principles enable one to trace at least three rays leaving a point, and thus to find its image and to draw images for any point or for any object as formed by such a lens. Drawings are given for a few special cases:

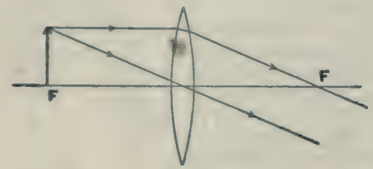


FIG. 7.

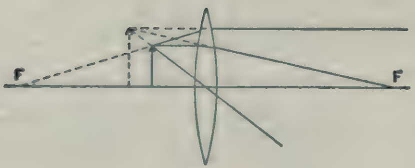


FIG. 8.

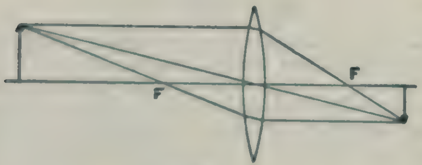


FIG. 9.

It is evident from the formula that if $u < f$, $v < 0$ and the image is virtual as shown in Fig. 8. In this case the image is magnified. The plane perpendicular to the axis at a principal focus is called a focal plane. If an object lies in this plane, as shown in Fig. 9, the image of each of its points lies off at infinity, as appears from the fact that the rays are parallel after leaving the lens. Conversely, parallel rays falling upon a lens for which *f* is positive converge after passing through the lens to that point in the focal plane through which passes that one of the parallel rays which cuts the lens at its middle point or centre.

2. *f* is essentially negative.—As a special case let *O* be at an infinite distance, i.e., $u = \infty$, and all the rays from *O* are lines parallel to the axis. Therefore $v = f$, a negative quantity; and *O′* is on the same side of the lens as *O* at a distance *f* from the lens. This point is called a principal focus; and there is evidently another one on the other side of the lens at the same distance from it. Therefore all rays parallel to the axis on one side of the lens *diverge* after passing through the lens as if from a point at a distance *f* from the lens on the same side as were the parallel rays. For this reason a lens of this kind is called a diverging one. Similarly a ray on one side of the lens pointed towards the principal focus on the farther side emerges from the lens parallel to the axis. Further, a ray through the centre of the lens remains parallel to itself. These principles enable one to trace at least three rays leaving a point not on the axis and thus to find its image, and to draw images of any object. Drawings are given of a few special cases:

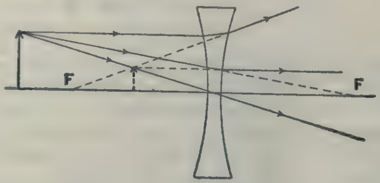


FIG. 10.

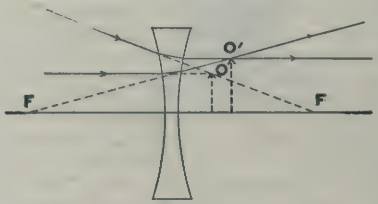


FIG. 11.

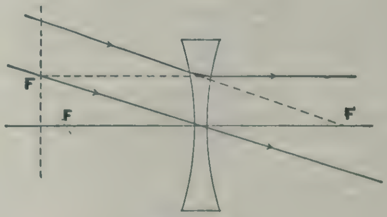


FIG. 12.

It is evident from the general formula that *v* will be positive, i.e., there will be a real image, if *u* is negative and numerically less than *f*, i.e., if *O* is on the opposite side of the lens from that on which the rays enter, and between the lens and the principal focus. This is the case when the entering rays are converging towards the point *O*, as shown in Fig. 11; under these conditions *O* would be called a virtual source. Again, as is seen from Fig. 12, parallel rays falling on the lens emerge as if coming from that point in the focal plane on the same side as that from which the rays come where the ray through the centre of the lens meets the plane.

If two thin lenses of focal lengths f_1 and f_2 are put close together with their axes coinciding, they form a lens whose focal length *f* is given by the formula

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}.$$

If the two lenses are at a distance d apart, the focal length of the combination f is given by the formula

$$\frac{1}{f}=\frac{1}{f_1+d}+\frac{1}{f_2}.$$

If the lens is not thin, but so thick that this fact must be taken into account, it may be proved that there are two planes perpendicular to the axis, either in the lens or near it, which are so placed that if u is the distance from the source O to one plane and v that from the image O' to the other, the same formula as before applies. These planes are called the principal planes. They have other important properties also; but for a full discussion of thick lenses and their combination reference must be made to some treatise on optics.

Lenses and systems of lenses as used in microscopes, telescopes, photographic apparatus, etc., are subject to the following—among other—imperfections:

1. *Spherical Aberration.*—An oblique ray from a point on the axis does not pass through the same focus as does a homocentric pencil. See ABERRATION OF LIGHT.

2. *Curvature of Field.*—The image of a large plane figure perpendicular to the axis will not be formed on a plane but on a curved surface.

3. *Distortion.*—The image of a large object, e.g., a building, is not similar in all its parts to the parts of the object; the magnification may be different and a rectangular portion of the object may appear in the image with curved edges.

4. If the image of a small plane area perpendicular to the axis is formed by a lens which is large compared with the object, the image is not a small plane area perpendicular to the axis unless Abbe's sine formula is satisfied. If the system satisfies this condition, it is called *aplanatic*.

5. *Chromatic Aberration.*—Owing to the fact that the index of refraction differs with the color of the light, there are different focal lengths for rays of different color; and, further, if the lenses are thick, the magnification is different also. See ACHROMATISM.

Many of these imperfections can be avoided by a suitable choice of material for the lenses, by proper curvature for the lens surface, and by using suitable combinations of lenses. Lens combinations which are free from certain errors are called by special names. A photographic lens free from distortion of field is called orthoscopic; one free from curvature of field and from chromatic and spherical aberrations is called anastigmatic; a microscopic objective free from secondary spectra of chromatic aberration and aplanatic for several colors, apochromatic.

Several facts should be borne in mind in regard to an optical combination: 1. The intrinsic brightness of any surface cannot be increased by any optical means. The natural brightness of any object—that is, the light received per square centimeter of the image on the retina of the eye when looking directly at the object—is as great as the brightness when looking at the object through a telescope or microscope. 2. The brightness of a star or point source may, however, be increased by using a telescope, because by means of it more light is brought into the eye; the increase is in general proportional to the ratio of the area of the object glass of the telescope to that of the iris of the eye. 3. No amount of magnification will enable one to resolve two point sources—i.e., to see them as two separate objects—if they are as close together as a certain fraction of the wave length of the light which they are emitting. This fact depends upon the properties of diffraction of the ether waves, and will be discussed later. For detailed description of various optical instruments, see the articles MICROSCOPE; TELESCOPE; SPECTROSCOPE; ETC.

PHYSICAL OPTICS

In this branch of light the assumption is made that the sensation called light is due to the reception into the eye of trains of waves. A source of light is, then, a source of waves which are propagated from the source to the eye—or to whatever instrument is used to detect their presence—and produce there certain effects. The phenomena to be considered are then (1) the fact that trains of waves carry energy; (2) the fact that waves are propagated with a finite velocity; (3) the kinematic properties of composition of wave motion.

Photometry (q.v.) is that division of light which is concerned directly with the comparison of quantities of light emitted by various sources and received by different bodies. If a point source emits in all directions a quantity of light M, its intensity is said to be $M/4\pi$, i.e., the quantity of light going out through a unit solid angle. This intensity is written I. A small surface of area A, at a distance r from the point source, and inclined to the line joining it to the point source so that the angle between this line and a line perpendicular to the surface is θ, receives therefore an amount of light $\frac{IA\cos\theta}{r^2}A$. The intensity of illumination of this surface is the amount of light per square centimeter; it is written E. Hence $E=\frac{I\cos\theta}{r^2}$. Therefore the illumination varies directly as the intensity of the light, inversely as the square of the distance, and as the cosine of the obliquity of the surface.

Velocity of Light. The fact that time is required for the propagation of whatever it is that causes light has been known since the observation of Roemer on the eclipses of Jupiter's satellites in 1675. It follows then—granting that light is due to wave motion—that there is a medium filling all interstellar space, which serves to convey these waves. This medium is called the ether (q.v.), and it is evident from the properties of transparent bodies that it permeates them, and may in fact be regarded as a universal medium. There is every reason, both theoretical and experimental, for believing that the velocity of waves of all lengths is the same in the pure ether, e.g., in interstellar space; but inside of ordinary matter the velocity of ether waves varies with the wave length, and of course their velocity is different in different media. It will be shown below under *Refraction* that the index of refraction of one medium with reference to another for a definite color is the ratio of the velocity in the second medium of these ether waves which correspond to that color to that of the same waves in the first medium. There are two experimental methods for the determination of the velocity of ether waves in air—or, as often expressed, the velocity of light in air. One depends upon the use of a toothed wheel, which is made to revolve rapidly in front of a source of light, thus allowing intermittent flashes of light to be seen through the teeth. These waves coming through the gaps between the teeth traverse a considerable distance—several miles—and fall upon a mirror which reflects them back in their original direction. If on their return to the wheel the latter has turned so far that they strike a tooth, they are stopped; if, however, the wheel has turned farther so that they find an opening between the teeth, they will pass through and their return may be observed by suitable means. If the speed of the wheel is thus exactly right, the waves passing out through one opening will return through the next; if the speed is now increased, the returning waves will be stopped by a tooth; if the speed is still further increased, the waves passing out through any one opening will return through the next but one, etc. Therefore, if the speed of the wheel, the size of the teeth, and the distance between the wheel and the mirror are known, the velocity of the waves may be calculated. This method is due to Fizeau and has been used by him, by Cornu, by Forbes and Young, and more recently by Perrotin. The other method consists in allowing light from a narrow slit to fall upon a mirror, be reflected to another distant mirror which reflects it back to the first mirror and thus back to the source. This first mirror is not stationary, however, but is made to revolve rapidly; so that, when the waves return from the distant mirror, the angles of incidence and reflection are not quite what they were before, and so the waves are not reflected directly back to the slit source, but are deflected slightly. If the amount of this deflection, the distance apart of the two mirrors, and the rate of revolution of the rotating mirror are known, the velocity of the waves may be calculated. This method is due in part to Fizeau also, but in the main to Foucault. It has been used by the latter, by Michelson, and by Newcomb. For several reasons this method is not so good as that of the toothed wheel. (See Cornu, *Reports of International Congress of Physics*, Paris, 1900, vol. ii, p. 225.) The accepted value for the velocity of light in air is 300,000 kilometers or 3×10^{10} centimeters per second, with a possible error of less than one part in 1000. This is about 186,600 miles per second. Foucault showed by direct experiment that the velocity of light in air is greater than that in water, an observation which definitely overthrows Newton's corpuscular theory of light.

Huygens's Principle. To show how the properties of rays, which were assumed as the basis of geometrical optics, are consequences of the propagation of ether waves, use must be made of a theorem in kinematics known as Huygens's principle. As a result of disturbances in any medium which can transmit wave motion there will be at any instant a definite wave front, *i.e.*, a surface which is the locus of all points just reached by the spreading waves; there will be no effect at any point ahead of the wave front until it is reached; but Huygens's principle asserts that we can predict what will be the effect at that point if we assume that each minute portion of the medium in the wave front is a centre of spherical waves. These spherical waves spreading out from each point of the wave front all start in the same phase; but, as they overlap and are superimposed at the point for which the effect is to be predicted, they will be in different phases depending upon the distances from this point to the various point sources. The entire effect at the point due to the compounding of these secondary waves is, in accordance with Huygens's principle, exactly the same as that due to the advance of the original wave front. This principle of Huygens has been perfected so as to give the proper amplitude and phase for the resulting motion, and serves as the basis for the explanation of all the purely optical phenomena of light. It will now be shown how this principle, combined with that of interference, explains the properties of rays.

Rectilinear Propagation. A point source of waves produces a spherical wave front in an isotropic medium, because the velocity is the same in all directions. Let O be such a point source of waves; NM the section by the paper of the spherical wave front at any instant; P is some point in front of the wave front; M is the intersection of the wave front by the line OP. When it is said that light travels in a straight line, it is equivalent to saying that if an opaque obstacle is placed with its edge at the point M its shadow will just include P. It can be shown that the principle of Huygens predicts that this statement is not quite accurate; and more careful experiments prove that the modifications suggested are observed. Instead of considering all the infinite spherical secondary waves, proceeding from the surface NM to P, the disturbances may be grouped together according to a manner devised by Fresnel. Call the distance PM a, and let the wave length of the waves be λ; then with P as a centre draw spherical surfaces of radii $a + \frac{\lambda}{2}$, $a + \lambda$, $a + \frac{3\lambda}{2}$, etc. These surfaces will intersect the spherical wave front in circles which will thus include zones between them, the distinguishing characteristic of a zone being that any point in it lies at such a distance from P that there are points in the two contiguous zones for which the distances to P differ from it by half a wave length. Consequently, if the combined effect of the action of all the secondary waves from the points of any one zone is to produce action in one direction, the resultant action due to both the neighboring zones is in the opposite direction. Let the numerical values of the effects at P due to the different zones be m_1, m_2, m_3, etc., for the first or central zone around M, the second, third, etc. The final numerical value of the action of the secondary waves is, therefore,

$$m_1 - m_2 + m_3 - m_4 + m_5 - \text{ etc.}$$

The value of m for any zone depends upon three things: the area of the zone, the distance of the

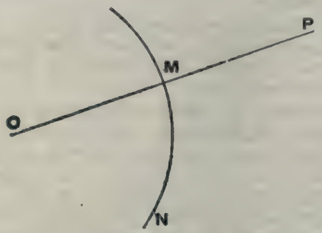


FIG. 13.

zone from P, and the inclination of the line joining P to the zone with the line PMO. It may be shown that owing to these causes the value of M for any zone is less than that for the one just inside; and, if the wave length is small, as it is in the case of ether waves (and also for the waves produced in air by very shrill sounds), this difference between the numerical values of the action for the zones is small. Under these conditions the above sum $m_1 - m_2 + m_3 -$ etc., reduces to simply $\frac{1}{2}m_1$. In words, the action at P owing to the secondary waves from any one zone is neutralized by that of the waves from one-half of each of the neighboring zones; and so the final action at P is one-half of that due to the secondary waves from the central zone around M, because in the case of a large wave front the effect of the outmost zone may be neglected. If the wave length is extremely small, as in ether waves, the areas of these zones are almost infinitesimal; but if the wave length is long, as in aërial waves, they have a sensible size. If the action of the central zone is blotted out by an opaque obstacle, the action at P due to the rest of the wave front spreading out from the source at O is $m_2 - m_3 + m_4 -$ etc., or $\frac{1}{2}m_2$, and is therefore hardly changed at all, if the zones are small. If the obstacle blots out two zones, the action at P is $\frac{1}{2}m_3$; etc. Consequently, if any small circular opaque disk is placed at M at right angles to the radius, there is always action at P, and its value is one-half that due to the first zone outside the edge of the disk. Naturally as a larger and larger disk is used the intensity of the action at P decreases. Similarly, if an opaque screen with a circular opening is placed at M, the effect at P depends upon the area of the opening. If this area is that of the first zone, the action at P is twice what it would be if the screen were entirely removed; if the area includes two zones, there is practically no action at P; etc.

If the opaque screen has zonal openings so as to expose only the odd zones, the effect at P is $m_1 + m_3 + m_5 +$ etc., and so is very intense. If this zone plate, so called, is modified so that the opaque rings are replaced by transparent rings of such a thickness as to introduce a difference of half a wave length by virtue of the fact that the velocity of light in the transparent material is less than in air, all the zones will conspire to help in the action at P. It is evident that the size of the zones varies with the color of the light; and if white light—or a mixture of colors—is coming from the source, passing either through a small circular opening or around a small circular disk, there will be colored effects near P. All of these effects with openings and disks are amply verified by experiments with both ether and aërial waves, the only difference coming from the fact that the aërial waves are as a rule many centimeters long, while the ones in the ether that affect our sight are about 0.00005 of a centimeter long.

If a large opaque screen ML is placed near a point source O, as in Fig. 14, rays drawn grazing its boundary form what is called the geometrical shadow. Thus, if OMP is one of these rays, the shadow lies on one side of it. The effect at a point Q just within the shadow can be found by considering the zones on the wave front around N, which correspond to Q. It is evident that there is an action at Q due to those zones which are not obscured by the obstacle. As points are taken farther and farther in the shadow, however, this effect becomes less and less, gradually fading away. (This explains why aërial waves pass around corners into the shadow, and asserts the same phenomena for ether waves, only to a much less distance, owing to the smallness of the zones in their case. This is actually observed.)

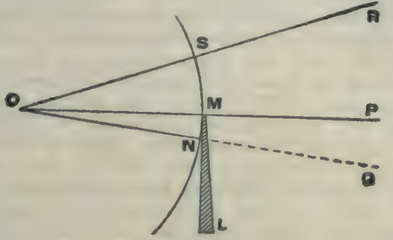


FIG. 14.

Similarly the action at a point R outside the shadow depends upon the number of zones drawn around S, the intersection of OR with the wave front, which are not obscured by the opaque obstacle. If R is very close to P, only the first zone may be uncovered, and the action is intense; but as R recedes from P the second zone begins to neutralize the action of the first, and so the intensity at R decreases; then, as R continues to recede, the action again increases, etc., until R is so far away from P that the action of the zones of high order makes no difference. Consequently, if homogeneous light is used, and a screen is placed to receive the shadow, there will be no sharp shadow, but the light will gradually fade away in the geometrical shadow, while outside this shadow there will be bright and dark bands following the general shape of the obstacle. These phenomena can be easily observed. If white light is used, these rings will be colored, because their position depends upon the wave length and so each color will have its own set of rings; but at a comparatively short distance from the edge of the geometrical shadow the effect is a uniform white illumination. These bands are called diffraction bands; and the whole phenomenon is said to be due to diffraction (q.v.), as is also that of the small disks and openings.

These diffraction rings or bands are seen most clearly if the opaque obstacle has a linear edge like a knife edge and if it is illuminated by light coming through a *slit* parallel to this edge; then, if the light is received on a screen suitably placed, the bands will be most distinct. Other cases of diffraction will be discussed later.

It thus appears that the sense in which light travels in straight lines is not in the casting of sharp shadows, for it does not, but in the fact that as ether waves spread out from a point source O, there being no obstacles, the effect at a point P is due entirely to the action of a minute portion of the wave front around M where the ray OP intersects it.

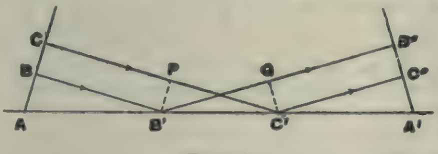


FIG. 15.

Laws of Reflection. It is not difficult to show that the laws of reflection are a direct consequence of the principle of the rectilinear propagation of light. Let $AB'C'A'$ be the section of a plane surface by the paper; draw the line ABC to represent the section of a plane by the paper, and similarly the line $A'C''B''$, making the angles CAA' and $C''A'A$ equal; draw the lines CC' and BB' perpendicular to the plane ABC and the lines $C'C''$ and $B'B''$ perpendicular to the plane $A'C''B''$; draw also $B'P$ perpendicular to CC' and $C'Q$ perpendicular to $B'B''$. If the plane $A'C''B''$ represents a wave front receding from the plane surface $AB'C'A'$, the actions at B'' and C'' are entirely due to those that were at B' and C' a short time previously; similarly, if the plane ABC represents an advancing wave front, the actions at B' and C' will be due to those now at the points B and C. Therefore if the time taken for the disturbance to pass from B to B' to B'' is the same as it is for the disturbance to pass from C to C' to C'', the receding wave front is due to the reflection at the surface $AB'C'A'$ of a wave front which was at ABC some time previously. But these times are the same because the lengths of the lines $CC'C''$ and $BB'B''$ are evidently equal by geometry, and the medium in which the disturbances are traveling is the same for both. Consequently the ray BB' is reflected into the ray $B'B''$; they make equal angles with a line drawn perpendicular to the surface at B' and these lines lie in one plane.

Laws of Refraction. In a similar manner the laws of refraction may be deduced. Let $AB'C'A'$ be the intersection of the paper with a plane surface separating two transparent media; let ABC represent the section of the paper with a plane in one medium, and $A'C''B''$ with a plane in the lower medium; draw BB' and CC' perpendicular to the former and $B'B''$ and $C'C''$ perpendicular to the latter, also $B'P$ perpendicular to CC' and $C'Q$ perpendicular to $B'B''$. If ABC is an advancing plane wave front, the action at B' is due to that at B, and at C' to that at C; and, if $A'C''B''$ is a receding wave front, the action at B'' is due to previous action at B' and that at C'' to previous action at C'. Therefore the wave front $A'C''B''$ will be that due to the refraction of the wave front ABC, provided the times taken for the disturbances to pass from B to B' to B'' and from C to C' to C'' are the same. This will be true if PC' bears the same ratio to $B'Q$ that the velocity of the waves in the first medium (v_1) does to that in the second (v_2). That is, the condition is that

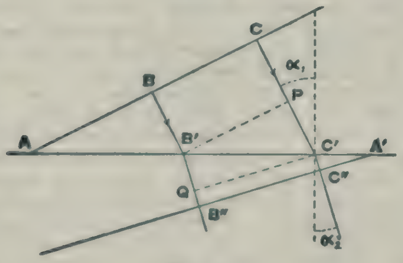


Fig. 16.

$$\frac{PC'}{B'Q} = \frac{v_1}{v_2}.$$

$$\text{But } PC' = B'C' \sin (C'B'P) \text{ and}$$

$$B'Q = B'C' \sin (B'C'Q)$$

and the angle $C'B'P = \alpha_1$, and the angle $B'C'Q = \alpha_2$. Hence the condition becomes

$$\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{v_1}{v_2}.$$

The velocity of any homogeneous train of waves in any one medium is constant (but varies with the medium); therefore for any such train of waves $\frac{v_1}{v_2}$ is a constant and may be written n as before, the index of refraction of the second medium with reference to the first. Thus it is seen that the incident ray CC' becomes $C'C''$ by refraction, that they lie in a plane which includes the perpendicular to the surface at C', and that their angles of incidence and refraction are given by the formula $\frac{\sin \alpha_1}{\sin \alpha_2} = n$, where n is a constant for any one train of waves. Thus n, and therefore the velocity of ether waves, may be found to vary both for different colors in one medium and for the same color in different media. Since it has been shown that in ordinary matter n increases as the color is changed from red to yellow, to green, to blue, etc., it is evident that the velocity of those waves which produce the sensation red—red waves—is greater in ordinary matter than is the velocity of green waves, etc. For if the first medium is the pure ether and the second air (or glass, or water), v_1 remains constant for all waves, and if n increases it must be because v_2 decreases.

Double refraction is at once explained if the assumption is made that, whereas a point source in an isotropic medium produces a spherical wave point, in media which have different properties in different directions a point source produces a more complicated wave front. To explain the simpler case of double refraction, that where one ray obeys the ordinary laws of refraction, Huygens assumed that the wave front was a combination of a sphere and an ellipsoid of revolution, the axis of revolution being a diameter of the sphere. In bodies of this nature there is always one direction in which they behave in all respects like ordinary transparent bodies. This is called the optic axis, and it is evidently in the direction of the axis of revolution of the ellipsoid of the wave front. (It is not a *line*, but a direction; and so all lines drawn in this direction within the body are optic axes.) These bodies are therefore called uniaxial. Let such a body have a face cut and polished making an angle θ with the optic axis, and let the paper make a section perpendicular to this face and including the optic axis. If

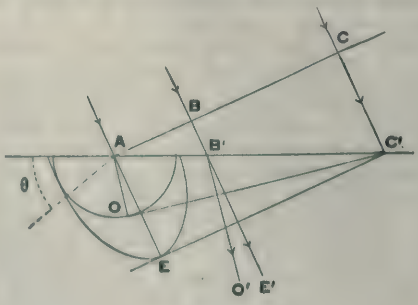


Fig. 17.

a plane wave front *ABC* is incident on this face, the disturbance at *A* in the uniaxial body sends out its double wave front, the section of which —a circle and an ellipse—is shown; and while the disturbance goes from *C* to *C′* in the air let the double wave front advance as shown. Then at this instant the wave fronts in the uniaxial body may be easily seen to be planes which pass through the line perpendicular to the paper at *C′* and are tangent to the sphere and to the ellipsoid. The disturbance from *A* has thus reached the points of tangency *O* and *E*; *AO* and *AE* are called the ordinary and the extraordinary *rays;* and it is evident from geometry that the latter ray does not in general obey either of the laws of ordinary refraction. Two lines drawn perpendicular to the wave fronts, e.g., *B′O′* and *B′E′*, are called the wave normals; and it is seen that in general the extraordinary ray does not have the same direction as the extraordinary wave normal, i.e., the ray is advancing in a direction different from the direction of advance of the wave front. In other doubly refracting bodies there are two optic axes; such are called biaxial. Fresnel explains their optical properties by assuming a peculiar kind of wave surface, which is too complicated for description here.

The wave surface of Huygens for uniaxial bodies may be regarded as definitely established by experiment; while all that can be said in regard to Fresnel's wave surface for biaxial bodies is that it is most probably correct.

Interference and Diffraction. The optical phenomena whose discovery established the fact that light is due to wave motion are those of interference (q.v.) so called. The simplest illustration of these is due to Thomas Young and is called after him. Three opaque screens are arranged in order; in the first there is a narrow slit at *O*, illuminated with some homogeneous light, e.g., a flame burning sodium; in the second there are two slits, O_1 and O_2, close together, parallel to the first and at equal distances from it; the waves spreading out from *O* illuminate the slits O_1 and O_2 so that they in turn become sources of *two identical* trains of waves—if the source at *O* flickers or changes in any way, both the secondary sources change together; waves from these two sources illuminate the third screen. Bands parallel to the slits, alternately dark and colored, are observed on this screen. These may be explained immediately if light is due to wave motion; because at points on the screen such that their distances to O_1 and O_2 differ by half a wave length or by an odd number of half wave lengths there will be complete interference, and consequently darkness. Similarly at points on the screen whose distances from the slits O_1 and O_2 differ by a whole number of wave lengths the two trains of waves will reënforce each other and there will be light. (It is evident that there is no destruction of energy—only a redistribution of it.)

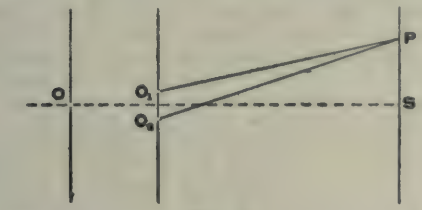


Fig. 18.

Referring to the figure, if *P* is a point in a bright band, $O_2P - O_1P = N\lambda$, where *N* is any integer number, 0, 1, 2, 3, etc., and λ is the wave length of the waves. If the distance from the receiving screen to the one with the two slits is *a;* if the distance apart of the two slits is *b*—a small quantity compared with *a;* and if *PS* is *x*, also a small quantity, it is seen by geometry that

$$\frac{x}{a} = \frac{O_2P - O_1P}{b}.$$

Hence $N\lambda = \frac{bx}{a}$; and the distance apart of the bright bands is therefore $\frac{a\lambda}{b}$. This distance, and both *a* and *b*, can be measured; so this experiment gives a means of determining λ. It is found that as the colors change from red to yellow, to green, to blue, the wave length of the corresponding waves becomes less. If white light is used, the central band at *S* is white, but the others are colored, all merging into each other. The wave length of the yellow light from a sodium flame is found to be 0.00005893 centimeters. Since the velocity of the waves is 3×10^{10} centimeters per second, the wave number for these yellow waves is about 5×10^{14}. (For other wave lengths, see Spectroscopy.) It is thus possible now to compare the indices of refraction of a given material—e.g., water—with the corresponding wave lengths. A curve plotted with the indices of refraction as ordinates and the wave lengths as abscissæ is called the dispersion curve of the substance. There are many other ways of securing two identical slits as sources of light besides the one here described, e.g., Fresnel's biprism and double mirror; but for a full description reference should be made to some treatise on light.

One of the most interesting phenomena depending for their explanation upon interference is that of the color of thin plates and of Newton's rings, as shown in the colors of soap films, very thin films of glass, or when a convex glass lens is pressed closely against a piece of plane glass. When parallel rays of light are incident upon a transparent film of uniform thickness, that portion which comes back, at the proper angle of reflection, is a mixture of waves which have suffered reflection at the top surface of the film and those which, having entered the film, have been reflected at the lower surface and then have emerged directly at the top surface or emerged after a series of internal reflections. If the relative retardation of the component trains of homogeneous waves is such that they have different phases equivalent to a difference of an odd number of half wave lengths, there will be complete interference; and it can be shown that all the waves have been transmitted through the film, so there is no loss of energy. If, therefore, the incident light is white, those waves will be absent from the reflected beam which satisfy the above condition; and so it will appear colored. It is proved easily that if the thickness of the film is *e*, its index of refraction with reference to air *μ*, and the angle of incidence of the light on the lower surface of the film *a*, there will be complete interference in the reflected light for a train of waves whose wave length in the film is λ if

$$N\lambda = 2e\mu\cos a,$$

where *N* is any whole number.

It is evident that the transmitted light is in any case complementary to that reflected; but there will always be differences in the apparent brightness of the colors, because there is so much white light transmitted.

If the film is of varying thickness, there will be different colors corresponding to the values of λ which satisfy the above equation for different values of e, the thickness. If homogeneous light—all of one color—is used, there will be seen colored bands separated by dark ones, depending upon the fact that the above equation is satisfied by different values of N (0, 1, 2, 3, etc.) for the same value of λ, if e is varying. The colored effects seen with white light depend upon the superposition of these colored bands due to the components of white light. It should be noted, however, that in order to see these colored bands the eye must be focused on the *surface of the film*, and a comparatively large source of light must be used. This is the explanation of Newton's rings.

If the film has perfectly parallel plane faces and is illuminated by a large source of homogeneous light (e.g., a flame), colored *rings*, separated by dark ones, may be seen by looking through the film at the source, the eye being focused for *an infinite distance.* These same rings may be seen to better advantage if a telescope focused for infinity is used to view the light. It is in this manner that the interferometers of Michelson and of Fābry and Perot are used. The colors obtained in Lippmann's method of color photography (q.v.) depend upon this principle of thin plates. The colors of the opal are due to similar causes. If a soap bubble could be imagined crushed and crumpled up, the colors would be like those of the opal.

There are two cases of diffraction which deserve special attention: one is when light with a plane wave front falls upon a single rectangular or circular opening, and the other is when waves with a plane wave front fall upon a series of rectangular openings regularly or irregularly spaced.

1. *Diffraction through a Rectangular Opening.*—If homogeneous waves with a plane wave front fall upon such an opening of width b and are then brought to a focus on a screen by a converging lens, it is observed that the illumination on the screen consists of a narrow band of light fading away into two dark lines, on the farther sides of which come two faint bright lines, etc., the central bright line being much more intense than the successive lines. This is called a diffraction pattern. If f is the focal length of the lens, the distance from the centre of the central light band to the centre of the neighboring dark band is $f\frac{\lambda}{b}$. This is illustrated by light from a distant star passing through a rectangular opening. If light from another star apparently near the first passes through the same opening, its diffraction pattern will be the same as for the former, but shifted slightly sidewise. If the angle between lines drawn from the slit to the two stars is a, the pattern will be shifted sidewise a distance equal to $f\tan a$. If this amount of shift brings the maximum bright band of one pattern to coincide with the minimum of the other, the resultant diffraction pattern will be such that it is *just possible* to distinguish the presence of two patterns. If the pattern is shifted less, it is impossible to recognize the presence of the two. The limiting closeness of the stars, so far as their angular separation is concerned, is then when

$$f\tan a = \frac{f\lambda}{b},$$

or, since a is very small, when

$$a = \frac{\lambda}{b}.$$

This is called the resolving power for a rectangular opening of width b.

Similarly, when a circular opening is used, the diffraction pattern consists of a bright spot fading rapidly into a dark ring, then a faint ring, a dark ring, etc.; and if the diameter of the opening is d its resolving power may be shown to be

$$a = 1.22\frac{\lambda}{d}.$$

Similarly, if two point sources are at a distance x apart and are at such a distance from a lens that the angular aperture of the lens as seen from either point is θ, the lens cannot resolve the points if x is so small that

$$x\sin\frac{\theta}{2} = \frac{\lambda}{2}.$$

This determines the resolving power of a microscope. The greatest value θ can have is 180°, and under these conditions $x = \frac{\lambda}{2}$.

(If the two points are in a medium whose index of refraction with reference to air is n—e.g., oil immersion microscopes—this limiting distance is $x = \frac{\lambda}{2n}$.)

2. *Diffraction through a Series of Parallel Rectangular Openings Regularly Spaced*, i.e., a grating. (See DIFFRACTION AND DIFFRACTION GRATINGS.)—If the width of each opening is b and of each opaque strip separating the openings is a, the sum $(a + b)$ or e is called the grating space. In general these gratings are made by ruling lines by means of a diamond point on a glass plate. Where the diamond makes scratches the surface is rendered opaque, and the spaces in between are transparent slits. An equally good arrangement is to rule lines on a polished metallic mirror and use it as a reflecting grating. As a rule the grating space is made very small, there being as many as 15,000 or 20,000 lines to the inch. (See DIVIDING ENGINE.) If homogeneous waves with a plane wave front are incident upon a grating at such an angle that the perpendicular to the wave front makes an angle i with the perpendicular to the grating, the waves diffracted through the openings will be broken up into beams leaving the grating in such direction as to make with the perpendicular to the grating angles given by the value of θ in the formula

$$N\lambda = e(\sin i + \sin\theta),$$

where N is any whole number, 0, 1, 2, 3, etc., positive or negative. The simplest case is when the incident light is perpendicular to the grating, i.e., $i = 0$; hence

$$\frac{N\lambda}{e} = \sin\theta.$$

The best method of observing these diffracted beams is to focus them upon a screen by means of a lens. The diffraction pattern will be a series of bright bands corresponding to the above formula, with other faint maxima and minima unless the grating space is small. If this is the case, the subsidiary maxima disappear and the bright bands shrink up into fine lines, the smaller the grating space the narrower these lines of light. Thus there will be lines of light for $\theta = 0$, $\theta = \sin^{-1}\frac{\lambda}{e}$, $\theta = \sin^{-1}\frac{2\lambda}{e}$, etc.; i.e., there will be a central line and others on each side of this, forming what are called the first, second, etc., spectrum according as $N = 1, 2$, etc. The grating space can be measured; the order of the spectrum is known in any particular case; θ can be measured by a goniometer, and so the wave length of the ether waves may be determined. This is one of the most accurate methods known for the measurement of the wave lengths of ether waves.

If white light is used, each component train of waves will have its own maxima at definite angles; and so the light is analyzed into its parts, forming a central white image and series of colored spectra on each side. It may be shown that if m is the entire number of grating spaces and if two trains of waves of wave length λ and $\lambda + \Delta\lambda$ (where $\Delta\lambda$ is small) are viewed in their spectra of the Nth order, they will have bright lines so narrow as to be separate enough to recognize the existence of both if $\Delta\lambda = \frac{\lambda}{mN}$. $\frac{\lambda}{\Delta\lambda} = mN$ is defined to be the resolving power of the grating. A spectrum in which each train of waves of a definite wave length is represented by a line of light as fine as possible is called a pure spectrum.

When diffraction through a great number of equal parallel slits irregularly spaced takes place, it may be shown that the effect is simply that of a single slit, only greatly intensified. Similarly, if a great number of circular openings of the same size or of circular disks of the same size are placed at random in front of a point source of light, the diffraction pattern is simply that due either to a single opening or to a single disk. The color halos around the moon are in certain cases due to the diffraction past circular disks of floating drops of water.

Polarization. All the phenomena so far discussed depend for their explanation upon the assumption that light is due to wave motion; and therefore similar ones may be observed with all kinds of wave motion; e.g., aërial waves may be reflected, refracted, and diffracted, and may be made to interfere. But there are certain other phenomena in the case of light which establish the fact that the ether waves which produce light are *transverse*, i.e., the vibration in the ether is at right angles to the direction of advance of the waves. In other words, the vibration in the ether is in the wave front as the waves advance in the pure ether or through isotropic material bodies. This may be proved in several ways. Perhaps the simplest is this: cut two identical plates of a crystal of tourmaline; let ordinary white light from the sun or from a lamp pass through one of these plates and then let it fall perpendicularly upon the other; if this second plate is turned slowly around an axis parallel to the rays of light, it will be noticed that, during one complete revolution of the plate through 360°, there are two positions differing by 180° for which no light emerges from the second plate, while halfway between these two positions the emerging light has its maximum intensity. This observation can be accounted for only if it is assumed that, after the waves have emerged from the first plate, the vibrations in the ether are all in parallel straight lines perpendicular to the direction of the rays, the direction of the vibration being in some way connected with the properties of the crystal of tourmaline; this means that the crystal transmits vibrations of a definite direction only, which is fixed by its crystalline properties.

Similarly, the second crystal will transmit only those vibrations which are in straight lines parallel to some line fixed by its crystalline properties. If, therefore, the waves incident upon the second plate have their vibrations parallel to this fixed direction—and this will happen twice in one complete revolution of this plate around an axis parallel to the rays—the waves will be entirely transmitted; whereas, if the direction of the vibration in the incident waves is at right angles to the fixed direction in the second plate, no light can be transmitted; and for positions where these two important lines make an acute angle with each other, a component of the energy of the waves passes through. The waves after passing the first plate of tourmaline are said to be plane polarized, meaning that all the vibrations in the waves are now in parallel straight lines. A test for plane polarized waves, further, is to see if they can pass through a thin plate of tourmaline with maximum intensity for two positions of the plate, and be cut off completely for two positions at right angles to the other two.

In this way it may be shown that each of the beams of light transmitted by a doubly refracting substance is plane polarized, but that the position of the tourmaline plate required to produce extinction of one beam is perpendicular to that required to extinguish the other: the two beams are said to be polarized in planes at right angles to each other. (In fact tourmaline is itself a uniaxial double refracting substance; but unless it is made in a very thin plate, only one kind of ray is transmitted, the extraordinary—the ordinary rays are absorbed in the crystal.) Similarly, if ordinary light falls upon a plane face of any isotropic transparent substance, e.g., glass or water, both the reflected and the transmitted waves are found to contain some that are plane polarized, but in planes that are at right angles to each other for the two cases; and for a definite angle of incidence for each such substance all the reflected light will be plane polarized. (Different kinds of plane polarized light are distinguished by saying that they are polarized in different planes. By definition the plane of polarization of light polarized by reflection is taken as the plane which includes the incident and reflected rays.)

This angle of incidence is called the polarizing angle for the transparent substance. (The tangent of the polarizing angle equals the index of refraction. This is known as *Brewster's law.*) The refracted light in this case is a mixture of ordinary light and plane polarized light.

The two methods most in use for producing plane polarized light are to allow ordinary light to be reflected from glass at the polarizing angle, and to allow ordinary light to pass through a Nicol prism. This consists of two pieces of a crystal of Iceland spar cut in a definite manner and cemented together by Canada balsam; Iceland spar is a uniaxial crystal and so the incident light is broken up into two trains of waves, the ordinary and the extraordinary; when these reach the layer of Canada balsam, the former suffers total reflection, while the latter is transmitted; thus the emerging light is plane polarized. It is found, too, that the light scattered by fine particles, e.g., the blue light of the sky, is plane polarized.

It is possible by several methods so to alter plane polarized light that all the vibrations in the ether as the waves pass are in circles or in ellipses; such light is called circularly or elliptically polarized. Ordinary light such as comes from the sun or a lamp can be considered as a mixture of all kinds of polarized light, plane, circular, and elliptical. (If plane polarized light is reflected from a metallic surface it becomes elliptically polarized.)

If ordinary light is incident upon a thin plate of any doubly refracting substance, it may be shown that two beams of plane polarized light—with their vibrations at right angles to each other—will be transmitted; and further, these beams will travel through the plate at different speeds, so that on emerging one will be slightly in advance of the other so far as the phase of the waves is concerned. If these two beams now enter a Nicol prism, only a component of each will be transmitted, for the prism allows to pass vibrations in a definite direction only, which direction is not in general that of the vibration in either of the two beams. If the light which falls upon the thin plate is itself plane polarized, it will be broken up as before into two beams, and they will be recombined into a plane polarized beam by the Nicol prism. The two component beams are in different phases; and, if one is retarded by an amount equal to half a wave length for any color or any odd number of half wave lengths, then, when these beams are combined by the Nicol so as to have their vibrations all in one direction, the waves of this particular color will be absent, owing to interference, if the intensities of the two coinciding beams are the same; and if the incident light is white the emerging light will be colored. (If the incident light had not been plane polarized, there would not have been a definite relation between the intensities of the beams coinciding in the Nicol prism.) This experiment offers a most delicate test of the double refraction of any substance: place two Nicol prisms in line, and turn one around its axis until no light is transmitted through the two—they are said to be crossed; now introduce between them the substance to be investigated. If it is doubly refracting, light will now be transmitted through the Nicol prisms. This is sometimes called depolarization.

ETHER AND MATTER

Among the phenomena of light which can be explained only by assuming some definite connection between the ether and matter, are dispersion, both regular and anomalous; absorption and emission; color; fluorescence and phosphorescence; rotation of the plane of polarization by quartz and other bodies; metallic reflection; the various magnetic actions on light; etc.

Dispersion. As has been already explained, dispersion is due to the fact that ether waves of different wave length have different indices of refraction for any one material substance; i.e., they have different velocities in it. As a rule the velocity decreases, i.e., the index of refraction increases, as the wave length decreases. This is called regular dispersion. There are, however, many substances for which this is not true; e.g., in fuchsin the indices of refraction of the red and yellow waves are greater than those for the blue and violet. If a spectrum of white light is formed on a screen by means of a slit, a prism of glass, and a lens, the colors will be arranged in the order red, yellow, green, blue, violet—the red being deviated least, i.e., having the least index of refraction. If, however, a prism of fuchsin is used in place of the glass one, the order of colors will be blue, violet, red, yellow—the green being absent. Fuchsin is a substance having a green surface color (see COLOR), and so this color is absent in the transmitted light. The resulting spectrum produced by a fuchsin prism is then exactly as if the ordinary spectrum had been cut in two by the removal of the green and the two halves displaced over each other. In other words, with bodies possessing surface color of a definite wave length, the indices of refraction of the waves on the two sides of the absorbed waves are changed; if their indices are less than that of the absorbed color for ordinary media, they are increased, and vice versa. This is known as anomalous dispersion.

Dispersion, both regular and anomalous, is due to the reaction of the electrons in the material atoms upon the ether-waves. As these enter the matter they produce vibrations of the electrons, and the effect is to change the apparent inertia of the ether, thus causing a change in the velocity of the waves.

Absorption. When white light falls upon any material substance there is always a certain amount scattered from the surface, and also as a rule some scattered from the interior portions of the body if light enters. The light scattered from the surface is white, but if the body is a piece of polished metal or has a metallic lustre, there is mixed with the white light some that is colored. This colored light is due to the fact that there is a certain amount of absorption of waves of a particular wave length at the *surface*. Thus, gold appears yellow because out of the incident white light the bluish-green light enters at the surface, and the yellow light is reflected. If a sheet of gold is hammered out extremely thin, the transmitted light is bluish. If the light penetrates into a substance, and is either transmitted through or reflected out by small solid particles as mirrors, the color is generally the same, being due to the absorption of certain waves in the body of the substance. (The energy of these absorbed waves goes generally into heat effects, but may be spent in producing fluorescence, q.v.) Some substances absorb two or more colors to different extents; so a thin plate of it will be of a different color from a thick one.

As explained in the article on COLOR, the particular color ordinarily attributed to a substance is that perceived by a normal eye when viewing the substance in white light. There are two methods for determining the cause of the color of an object. One method is to put it, if it is not opaque, between the slit and prism of a spectroscope, the slit being illuminated by white light, and to notice the change in the spectrum. The resulting spectrum is called the absorption spectrum of the body, and the colors which are transmitted are the ones which, when combined in the eye, produce the color of the object. The other method is to throw a pure spectrum of white light on a screen, and to move the object slowly through the spectrum; if it appears black when held in any color, it shows that the waves of this color are absorbed by the object. If two pieces of colored glass are superimposed, or if two colored paints are mixed, the resulting color is that due to the waves which are left after each glass or each paint has absorbed its colors; it is therefore a process of double subtraction of colors.

Absorption must be due to the fact that the electrons in the atoms of the matter can vibrate in definite periods; and if ether waves of a proper period enter the substance they will by resonance set these in vibration and so lose their own energy. If the energy thus gained by the electrons is dissipated among the molecules, increasing their energy, heat effects are produced. It may happen, however, that electrons are set vibrating by the absorption of ether waves, and, instead of having their energy spent in heat effects, other ether waves are emitted. This is called fluorescence (q.v.). Thus, a solution of quinine absorbs ether waves whose period is so short that they are invisible, and in return for them emits violet and blue light. If the fluorescent body continues to emit light for some time after the incident light is cut off, it is said to be phosphorescent. In the case of solids and liquids the fluorescent light is of a longer wave length than the absorbed light; but with vapors the phenomenon is much more complicated.

Radiation. As explained in the article RADIATION, all material bodies are emitting ether waves; i.e., by reason of the vibrations of the electrons in the atoms, disturbances are produced in the ether. The nature of these waves emitted by any body may be determined by analyzing the radiation, using a suitable dispersing apparatus—prism or grating or interferometer—and studying the resulting spectra. The difficulty comes in obtaining instruments which detect the presence of ether waves of all lengths. These waves carry energy; and if an instrument absorbs them, some change in it will be produced, provided it is sensitive enough, the kind of change depending on the nature of the instrument and the wave length of the waves. Thus, if waves of wave length extending from about 0.000015 centimeter to 0.00007 centimeter fall upon suitable photographic plates, there is chemical action produced; if waves of wave length between about 0.000039 centimeter and 0.000075 centimeter enter the human eye, color is perceived; if waves of wave lengths from 0.00004 centimeter to 0.007 centimeter are absorbed by suitable thermometers (q.v.), change in temperature is noticed. Waves longer than 0.015 centimeter have not yet been observed as being emitted by ordinary matter; waves longer than 0.2 centimeter may, however, be produced by electrical means. Using proper instruments, it has been proved that all solids and liquids, with only two or three exceptions, emit continuous spectra; i.e., waves of all wave lengths between certain limits can be shown to be present. Gases, however, when rendered luminous by the passage of an electric discharge through them or when produced by vaporizing solids in the electric arc, give discontinuous spectra; i.e., only isolated trains of waves are present. This is what would be expected.

Since the emission spectrum of a gas is due to the natural frequencies of the electrons in the atoms, and since the absorption spectrum of any body when light of a continuous spectrum falls upon it is due to the absorption of the energy of those incident waves whose frequencies are the same as those of the electrons, it might be expected that those waves present in the former are absent in the latter. This is observed to be true, with certain limitations. See RADIATION and SPECTROSCOPY.

Rotation of the Plane of Polarization by Quartz, etc. A most important connection between matter and the ether is shown by the fact that when plane polarized light is passed through certain bodies—called optically active substances—the emerging light is plane polarized, but the plane of polarization, i.e., the direction of the vibration, has been rotated. If a Nicol prism is so placed as to extinguish the plane polarized homogeneous light before the optically active substance is introduced in the path of the light, it will be necessary to turn the Nicol around its axis through a certain angle in order again to extinguish the light after the substance is introduced between the source of light and the Nicol. In some cases the Nicol must be given a right-handed rotation, and in other cases a left-handed one. If the direction of the light is reversed in the body, so is the rotation. Bodies which necessitate the former are called dextrorotatory, and those which require the latter, lævorotatory. The amount of rotation of the plane of polarization is different for different substances; it is different for waves of different color, being greater for shorter waves; it varies directly as the thickness of the layer of the substance. In some specimens of quartz the rotation is right-handed; in others, left; and it is found that these two kinds of quartz have a similar difference in their crystalline structure. Turpentine is optically active; so are solutions of certain sugars, two forms of tartaric acid, and all organic compounds involving an asymmetrical carbon atom.

The explanation of this rotation was given by Fresnel and was verified experimentally by Brace. The rectilinear vibrations of the incident plane polarized light are resolved by the optically active substance into two beams of circularly polarized light; one right-handed, the other left-handed. These two beams traverse the substance with different velocities; so, when they emerge and again combine to form a rectilinear vibration, its direction is not the same as that in the incident beam.

Electromagnetic Phenomena. The connection between light and electromagnetic phenomena is shown in several ways: the identity in the properties of light waves and the waves produced by electric oscillations; the rotation of the plane of polarization in a magnetic field; the Kerr phenomenon; the Zeeman effect; etc.

It is shown in the article on ELECTRICITY that the waves produced by electric oscillations are transverse waves in the ether, and that they have the same velocity as light waves. They can be polarized, can be made to interfere, can be reflected, refracted, etc. The shortest wave length so far observed, for waves produced by electrical oscillations, is about 2 millimeters. It can be shown also that the velocity of ether waves in any transparent medium should vary as the square root of the reciprocal of the product of the electric and magnetic inductivities of that medium. The values of these quantities

(K and μ) for the pure ether can be written K_0 and μ_0; therefore the index of refraction of the transparent medium is $n = \sqrt{\frac{K\mu}{K_0\mu_0}}$. For all such media $\mu = \mu_0$; and $K_0 = 1$ on the C. G. S. electrostatic system; so $n = \sqrt{K}$, where K is the value of the electric inductivity (or dielectric constant) of the transparent medium. This n is the index of refraction for *very long waves*, because K is always measured by methods which involve slow oscillations. This formula is verified by experiment in many cases.

As noted also in the article on Electricity, when a beam of plane polarized light is made to pass along the axis of a powerful electromagnet, the plane of polarization is rotated in the direction in which the current in the magnetizing helix is flowing. This is called the Faraday effect. So, if the direction of the beam of light is reversed, the rotation is not. The amount of the rotation varies greatly with the transparent matter which occupies the magnetic field; it is proportional to the strength of the magnetic field; it varies with the wave length and with the temperature. This rotation is due to the motions of the electrons in the atoms caused by the action of the magnetic field. A moving electron is equivalent to an electric current; and its path is therefore changed if there is a magnetic field. For a full explanation some comprehensive treatise on light should be consulted.

It was stated in speaking of polarized light that if plane polarized light is incident upon a plate of polished metal, the reflected light is elliptically polarized. Kerr discovered that, if the metal surface is one end of a magnetized bar of iron, the reflected light is not the same as from a surface of unmagnetized iron. He found further that the changes were opposite in kind if the reflection took place from first a north pole and then a south one. Changes are also observed when the light is transmitted through thin films of magnetized iron.

Zeeman Effect. A most important discovery, made by Zeeman, has led to a series of interesting observations. He has shown that the light emitted by a flame when placed in a magnetic field is different from that emitted ordinarily, and further that there are differences depending upon whether the flame is viewed along the field of magnetic force or at right angles to it. These observations prove that the ether waves emitted by the flame are actually produced by the vibrations of minute portions of matter electrically charged, which have been called electrons. (In this connection reference should be made to the *Reports of the International Congress of Physics*, Paris, 1900, vol. iii, and to P. Zeeman, *Researches in Magneto-Optics*, London, 1913.)

Bibliography. Thomas Preston, *Theory of Light* (London, 1901), is to be recommended as an accurate and interesting treatise on optical theory. Other works to be recommended are: Henry Crew, *Wave Theory of Light* (New York, 1900); Paul Drude, *Lehrbuch der Optik* (2d ed., Leipzig, 1906; Eng. trans. by Mann and Millikan, New York, 1907); R. W. Wood, *Physical Optics* (ib., 1911). In the chapters on Optics in A. Winkelmann, *Handbuch der Physik*, vol. ii (2d ed., Leipzig, 1903), and in Müller-Pouillet, *Lehrbuch der Physik*, vol. ii (10th ed., Brunswick, 1906), will be found complete descriptions and explanations of optical phenomena.

LIGHT, Aberration of. See Aberration of Light.

LIGHT, Easement of. The right to the free access of light to one's windows from and over the land of another. The right to light arises only by grant or by use and enjoyment for a period of time long enough to confer what is known as a prescriptive right, i.e., from time immemorial. When acquired in the latter way, it is in England known as the easement of ancient lights (q.v.). In the United States it can in general be acquired only by grant, it being regarded as incompatible with prevailing conditions to permit its acquisition as against a neighbor by mere lapse of time. It has, however, been established by the New York Elevated Railroad cases (Story *v.* New York El. R. R. Co., 90 N. Y. Rep. 122) that a householder has an indefeasible right to light and air with respect to windows opening on a public street. The easement of light belongs to the class of so-called negative easements, as it involves no trespass or encroachment on a neighbor's land, as does the easement of a way, of drainage, and the like, but has the purely negative operation of preventing him from so using his land as to interfere materially with the light enjoyed by the premises to which the right attaches. The easement once created continues so long as the house stands to which it is appurtenant or until the latter is so altered as to show an abandonment of the right by the owner thereof. It should be noticed that one may always open windows overlooking another's premises without thereby infringing the latter's property rights, but that, in the absence of an easement of light, such windows may be darkened by the owner of such premises at his pleasure. See Easement; Prescription.

LIGHT, Equation of. See Equation of Light.

LIGHT, Standards of. See Photometry.

LIGHT BRAHMA. See Fowl.

LIGHT'ER (from *light*, AS. *lēoht*, Goth. *leihts*, OHG. *lihti*, *līht*, Ger. *leicht*, light, not heavy; probably connected with Lat. *levis*, Lith. *lengwùs*, Gk. *ἐλαχύς*, *elachys*, Skt. *laghu*, *raghu*, light). A strong, heavy, flat-bottomed boat of large size used for transporting cargo or heavy weights to and from ships. It is usually open, but the larger lighters have a deck and very large hatches with light, removable covers. In large harbors some lighters have a mast and a single sail set on a gaff, but without a boom. In small harbors oars or sweeps are used. The present very general use of tugs in the important harbors of the world has caused the development of large lighters that are designed to be towed and have no means of self-propulsion. Large steam and motor propelled lighters are becoming common. The speed of these is usually low—5 to 10 knots—the machinery placed well aft, and the decks and holds for cargo are forward of the machinery and deck houses. A lighter of this type usually has a mast and derricks with a power hoist for handling cargo.

LIGHT'FOOT, John (1602–75). One of the earlier Hebrew scholars of England. He was born at Stoke-upon-Trent in Staffordshire, March 29, 1602. He studied at Christ's College, Cambridge, and, after entering into orders, became chaplain to Sir Rowland Cotton in London, who, being himself a good Hebrew scholar, inspired Lightfoot with a desire to become one also. In 1629 appeared his *Erubhim, or Miscel-*

lanies, Christian and Judaical, dedicated to Cotton, who in 1630 presented him to the rectory of Ashley in Staffordshire. In 1642 he removed to London that he might have better opportunities for the prosecution of his favorite study; and in 1643 he was chosen rector of St. Bartholomew's, near the Exchange, to the parishioners of which he dedicated his *Handful of Gleanings out of the Book of Exodus* (1643). His most important work is *Horæ Hebraicæ et Talmudicæ, etc.* (1658–74), edited in Latin by Carpzov (Leipzig, 1675–79) and in English by Gandell (4 vols., Oxford, 1859). It is a commentary on parts of the New Testament from rabbinical sources. Lightfoot was one of the assembly of divines who met at Westminster in 1643 and, in the debates that took place there, betrayed predilection for the Presbyterian form of Church government. In 1644 he became rector of Great Munden, Hertfordshire, and so remained the rest of his life. In 1650 he was appointed master of St. Catharine Hall, Cambridge, and in 1654 vice chancellor of the university. At the Restoration he was confirmed in his rectory and mastership, and in 1662 he complied with the terms act of the university. He was made a prebendary of Ely in 1668 and died there, Dec. 6, 1675. His works in English, original or translated, first appeared in a collected edition (2 vols., London, 1684); the best edition is by J. R. Pitman, with biography and bibliography (13 vols., ib., 1822–25). Consult D. M. Welton, *John Lightfoot the Hebraist* (Leipzig, 1878), and Thomas Hamilton, in the *Dictionary of National Biography*, vol. xxxiii (London, 1893).

LIGHTFOOT, Joseph Barber (1828–89). An English prelate and student of early Christian literature. He was born in Liverpool and educated at King Edward's School, Birmingham, where his most intimate friend was E. W. Benson, the future Archbishop. Thence he went to Cambridge, where he was elected a scholar of Trinity in 1849 and a fellow in 1851. He was ordained deacon in 1854 and priest in 1858. He spent 30 years at Cambridge, taking a prominent place in all educational matters; he succeeded Ellicott in 1861 as Hulsean professor of divinity, and Selwyn in 1870 as Lady Margaret professor. The duties of a canonry at St. Paul's Cathedral (from 1871) and of a hard-working member of the company of New Testament revisers (1870–80) filled up all the time he could spare from Cambridge work. He had declined the bishopric of Lichfield in 1867, but accepted that of Durham in 1879. One of his first steps was to move for a division of the immense diocese by the creation of the see of Newcastle; and he labored indefatigably until his death in 1889 to promote every form of spiritual activity. He left a number of important theological works, especially the great edition of the Apostolic Fathers (*Clement of Rome*, 1869, 2d ed., 1890, on which he was working only three days before his death; *Ignatius and Polycarp*, 1885, 2d ed., 1889), and commentaries with revised text on the *Epistles to the Galatians* (1865), *Philippians* (1868), *Colossians and Philemon* (1875), all of which have gone through numerous editions.

LIGHT'HALL, William Douw (1857–). A Canadian author. He was born in Hamilton, Ontario, and graduated at McGill University in 1879. He subsequently studied law, was admitted to the bar in 1881, and became prominent in his profession in Montreal. He devoted much of his time to literature, was made an honorary member of the Scottish Society of Literature and Art, a fellow of the Royal Society of Literature of Great Britain, vice president of the Canadian Society of Authors, and founded the Society of Canadian Literature. He was interested in municipal reform and was one of the founders of the Union of Canadian Municipalities. His publications include: *Thoughts, Moods, and Ideals* (1887); *The Young Seigneur* (1888); *Songs of the Great Dominion* (1889); *The False Repentigny* (1889); *An Account of the Battle of Châteauguay* (1889); *Montreal after 250 Years* (1892); *The False Chevalier* (1898); *Hiawatha the Great* (1901); *Canada a Modern Nation* (1904); *The Master of Life* (1908); *The Governance of Empire* (1910).

LIGHTHORSE HARRY. A name given to the American general Henry Lee, on account of his cavalry operations during the Revolutionary War.

LIGHTHOUSE. A building on some conspicuous point of the seashore, an island or rock, from which light is exhibited at night as a guide to mariners. The importance of such structures has been understood since very remote times, and the ancients devoted considerable attention to lighthouse construction; but it is only within the last 100 years that these aids to the mariner have been developed upon systematic and scientific lines. At present all maritime nations have governmental bureaus or departments whose sole duty it is to establish and maintain lighthouses. In France this body is known as the Commission des Phares, and its membership comprises four engineers, two naval officers, one member of the Institute, one inspector general, and one hydrographic engineer. In England the Corporation of Trinity House has charge of the English lights; the Scottish lights are under the management of the Commissioners of Northern Lights, and the Irish lights are under the care of the Corporation for Preserving and Improving the Port of Dublin, which is commonly called the Ballist Board. The fund with which these boards carry on their work is provided by the one halfpenny per ton due charged every vessel at each time it passes the lighthouse. In the United States the construction and maintenance of lighthouses is in charge of the Commissioner of Lighthouses.

Ancient Lighthouses. The oldest lighthouses known were the towers built by the Lybians and by the Cushites of Lower Egypt. The light consisted of burning fuel in a brazier hung from a pole projecting from the tower towards the sea. The Romans built many fine light towers in Italy, but comparatively little is known about their construction and dimensions. Perhaps the most famous tower of antiquity was that erected on the island of Pharos near Alexandria about 285 B.C. The Romans built light towers at Dover and Boulogne on the English Channel. Little is known of the Dover tower, but the Boulogne tower was a masonry structure octagonal in plan, 192 feet in circumference and 200 feet high. It was built in 12 stories, each three feet less in diameter than the one beneath it. The rock on which this lighthouse was situated was undermined by the waves and fell, with the lighthouse, between 1640 and 1645, after the light had guided mariners for probably 1450 years. Towers of later mediæval times which are deserving of mention are the Torre del Capo, near Genoa, first built in 1139, removed in 1512 and rebuilt in 1643; the Pharos of Metoria, built by the Pisans in 1154 and several times destroyed and rebuilt; and the Tower of Cordouan, situated at the mouth of the Gironde and finished in 1610. These are only a few examples of ancient lighthouses, but they indicate quite well the general character of these early works, viz., towers of masonry on the tops of which were built fires to serve as lights.

Modern Lighthouses. Modern lighthouses may reasonably be said to date from the construction of the Eddystone Lighthouse by John Smeaton in 1756–59. The Eddystone rocks are a particularly dangerous reef lying in the English Channel about 14 miles from Plymouth, England. Smeaton's Eddystone Lighthouse was a circular masonry tower, broad at the base and narrowing by a curve to a slender waist at the base of the lantern housing. The masonry of the tower was a very intricate piece of dimension stone masonry, the stones being dovetailed together in such a way as to make each course practically a single stone. The height of the masonry structure to the focal plane of the lantern was 72 feet. In 1877 work was begun on a new Eddystone lighthouse to replace Smeaton's, which was not high enough to keep the waves from dashing over the lantern, and which, moreover, had become endangered by the undermining of the natural rock. In the new structure the tower was made cylindrical to a height of 2½ feet above the highest tides and diminishing in size above this level. It was made 132 feet high from high-water level to the focal plane of the lantern, the masonry being of dimension stones cut so as to interlock and further held together by bronze bolts. The new lighthouse was completed in 1882.

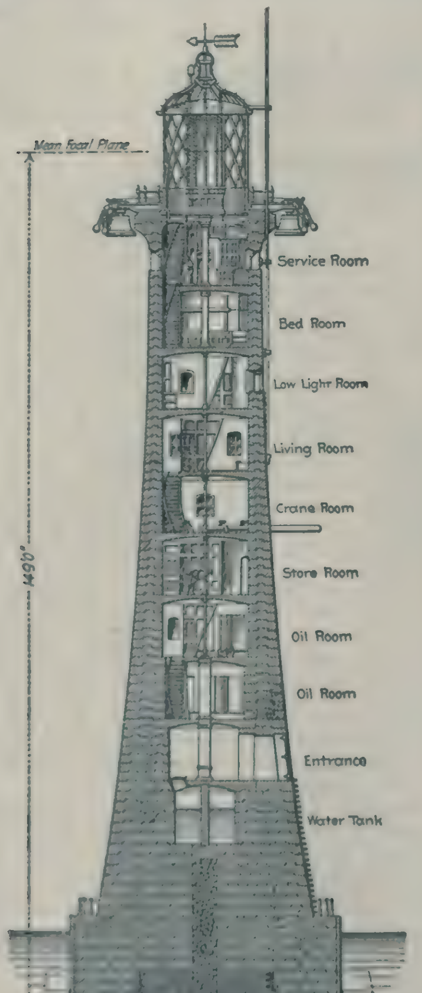
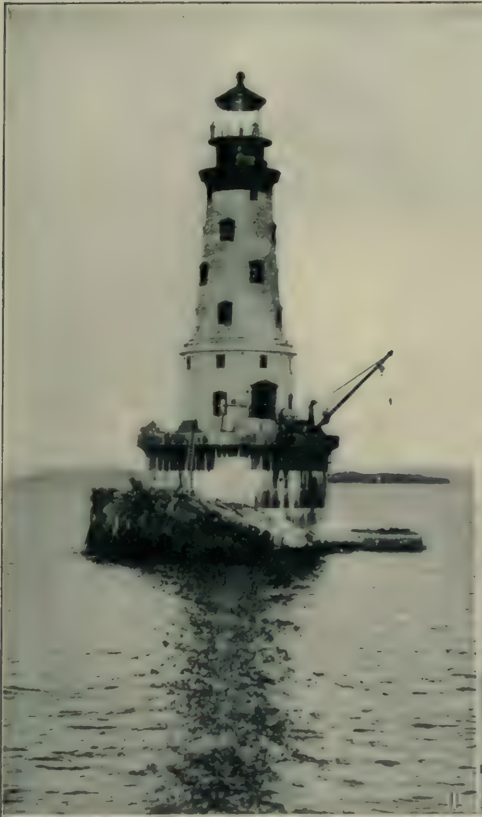


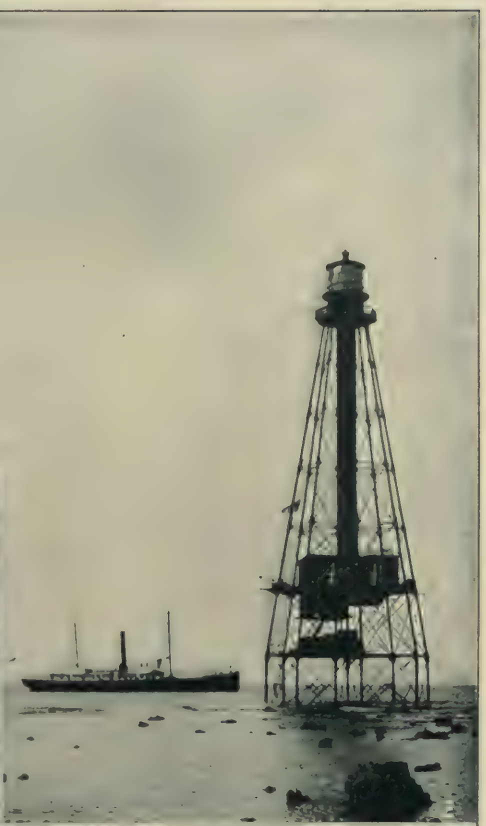
FIG. 1. VERTICAL SECTION SHOWING INTERIOR OF NEW EDDYSTONE LIGHTHOUSE.

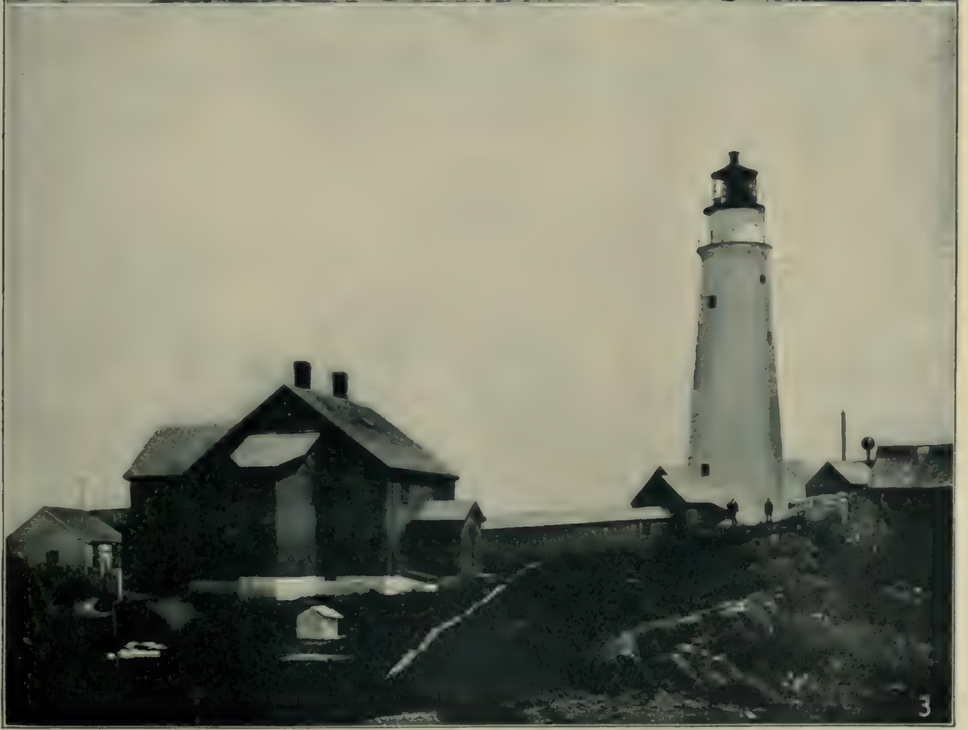
Faulty as Smeaton's design was in certain respects, it served as a model for lighthouse construction in masonry which has been followed in its general features ever since.

The Bell Rock Lighthouse, off the east coast of Scotland, is built upon a reef of rocks in the German Ocean, 11 miles from the coast, nearly opposite the Firth of Tay. The rock upon which it stands is red sandstone from 12 feet to 15 feet below spring tide, with from 2 feet to 4 feet exposure at low tide. The tower is also of sandstone, but the facing masonry for a height of 30 feet is granite. It was designed by the celebrated engineers Robert Stevenson and John Rennie and was modeled after the Eddystone Lighthouse of Smeaton. Its diameter at the base is 42 feet, and at the top beneath the cornice it is 15 feet. The stonework is 102½ feet high, and the top of the lantern is 115 feet high. Work was begun in 1807 and finished in 1810. The Skerryvore Lighthouse, off the west coast of Scotland, is built upon a cluster of rocks, the largest of which, known as Skerryvore rock, carries the lighthouse. The engineer was Allan Stevenson, who adopted a design for the tower resembling more nearly the frustum of a cone than did the Eddystone and Bell Rock towers. The tower is circular, 42 feet in diameter at the base, 16 feet in diameter at the top, and 138 feet high to the base of the lantern. Work was begun in 1838 and finished in 1842. Wolf Rock Lighthouse, situated on Wolf Rock between Scilly and Lizard Point, off the English coast, has a tower in the form of a concave elliptical frustum, 116½ feet high, 41⅔ feet in diameter at the base. It was begun in 1862 and finished in 1869.

The Héaux de Brehat Lighthouse is situated on the rock of the same name about 3 miles from the most northerly point of the peninsula of Brittany. It consists of a tower with an interior cylindrical opening 14 feet in diameter, 158 feet high from its base to the lantern floor. The tower consists of two parts—the lower part being a concave frustum and the upper part being nearly a true cylinder. The lighthouse of Ar-men, which is situated on one of a series of rocks off Cape Finisterre, France, is another masonry lighthouse of French design which is notable for its exposed situation and the consequent difficulties of construction. The height of the focal plane of the light is 96 feet above sea level. The lighthouse of Triagoz, in the Department of Nord, is another French example of exposed sea-rock lighthouse construction. The masonry tower is square and 92 feet high, with the focal plane of the light 6 feet above this height.





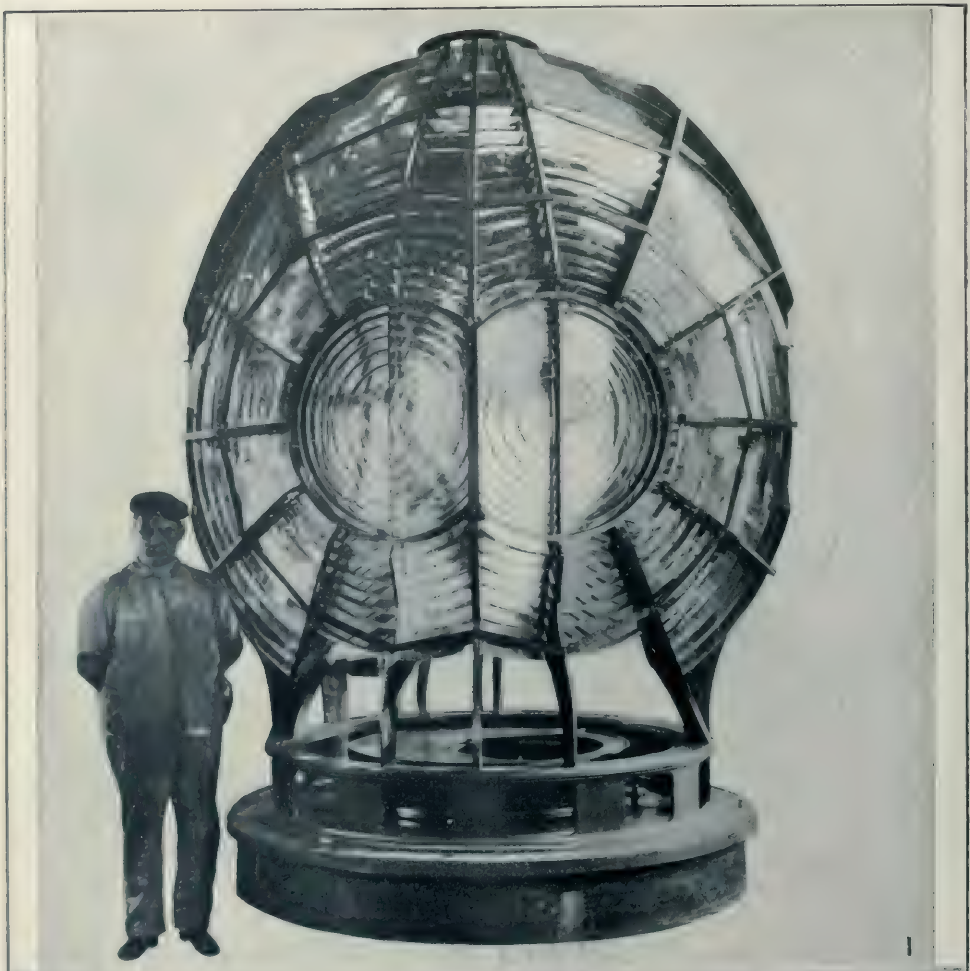


3

TYPICAL UNITED STATES LIGHTHOUSES

1. ROCK OF AGES LIGHT STATION, MICHIGAN. 2. SOMBRERO KEY LIGHT STATION, FLORIDA.
3. BOSTON LIGHT STATION, MASSACHUSETTS.

LIGHTHOUSES



1. **LENS, KILAUEA POINT LIGHT STATION, HAWAII.** A second order flashing lens of two groups, each of two panels, comprising seven refracting and seventeen reflecting prisms. The apparatus rotates on a mercury float driven by clock-work, and gives a double white flash every ten seconds, visible twenty-one nautical miles in clear weather. The light is furnished by an incandescent oil-vapor lamp.
2. **CAPE HATTERAS LIGHT STATION, NORTH CAROLINA.**

Another important light off the coast of Brittany, near Cape Finisterre, is that at Jument Rock at the island of Ushant. This is a circular masonry tower, 118 feet in height from water level to the focal plane of its lantern. Its construction was begun in 1904, and it was not completed until 1912, the total outlay for tower and lamp involving some 850,000 francs. The light shows red flashes in groups of three 15 seconds apart, and there is also an audible fog signal from a siren, which likewise consists of groups of three blasts. The tower, which is 36 feet in diameter at its base, has its foundation on solid rock, and the stones are strengthened by enormous tiebars, so as to secure the greatest possible stability. The masonry work involves some 61,800 cubic feet. The optical apparatus has six catadioptric panels each of an amplitude of 60° and 27.56 inches focal distance, and it is carried on a mercury float on a central axis. Incandescent gasoline lamps with mantles, 3.346 inches in diameter, supply illumination, and the power of the red flashes is stated at 3300 carcel burners, giving an illumination range of at least 20 miles during one-half the year and 7 miles during nine-tenths of the year.

Another interesting lighthouse of somewhat different construction was one built in 1908 at One-Fathom Bank on the Strait of Malacca, a reënforced concrete structure, which was founded on piles, driven through the sand to firm-bearing material. This was designed on the Hennebique system of reënforced concrete structure, with two rings of screw piles sunk in the sand and bound together at the top. On this a superstructure was built, so that a light can be maintained with its focal plane 925 feet above the water. The location was a most dangerous one, both for navigation and for the actual construction, as it was exposed to rough weather, with waves sometimes 8 feet in height, and a pronounced rise and fall of the tide. The lantern was raised above the superstructure, which contains the apartments for the keeper and supplies, and was carried on a superframing. It is a revolving light, giving groups of white flashes, and is visible 15 miles.

A light of different construction, built in 1909, at Cayo Caiman Grande, Cuba, consisted of a steel octagonal pyramidal tower, 115 feet in height, with a watchtower, surmounted by a lantern above, so that it was nearly 150 feet in height over all. At the base, which was 56½ feet in diameter, was located a house for the keeper of the light.

In the United States masonry lighthouse towers of notable character have been built at Minot's Ledge, Spectacle Reef, and Tillamook Rock. Minot's Ledge, off the town of Cohasset, in Massachusetts Bay, about 20 miles east-southeast of Boston, was one of the most dangerous places in the world before the establishment of a signal. The difficulties in the construction of a lighthouse upon this rock were immense. The first structure, which was of iron, was completed in 1849, but stood only until April, 1851, when it was demolished by a terrific storm. In 1852 money was appropriated by Congress for a new lighthouse, and work was commenced in 1855, but it was not till the latter part of 1857 that the first stone was laid. The structure was completed in 1860. It is a granite tower in the form of a frustum of a cone, having a base 30 feet in diameter, and a height of stonework of 88 feet, the lower 40 feet being solid. The courses are dovetailed and are fastened with wrought-iron dowels.

The lighthouse at Spectacle Reef, in the northern part of Lake Huron, was built not only to resist waves, but ice fields, often covering thousands of acres and moving at the rate of 2 or 3 miles per hour. That the structure should be able to withstand this force, it was so designed as to cause the ice to be broken and piled into a protecting barrier. The tower is the frustum of a cone, 32 feet in diameter at the base, and 18 feet just beneath the cornice at a height of 80 feet. The whole height of the stonework is 93 feet above the base, which is 11 feet below the surface of the water. The tower is solid as high as 34 feet, above which it contains five stories, each 14 feet in diameter. The work was commenced May 1, 1870, and the light was first used June 1, 1874. The cost was $375,000. Tillamook Rock is a bold isolated basaltic rock in the Pacific Ocean about a mile off Tillamook Head and 20 miles south of the Columbia River. The lighthouse on it, built in 1880–81, consists of a square masonry tower of no great height rising out of the centre of a masonry house 45 × 48 feet in plan, the tower proper being 16 feet square.

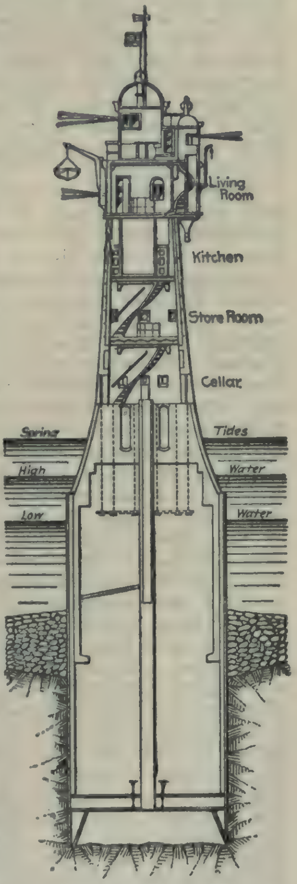


Fig. 2. VERTICAL SECTION SHOWING ROTHERSAND LIGHTHOUSE.

The lighthouses so far described were built upon solid rock, and the foundation problem was a simple one except for the work of combating the wind and waves. Another class of lighthouses of even more difficult construction comprises those structures which are located on shoals at long distances from the shore. Here the sinking of the foundations is a serious problem by itself, even were it not complicated by the dangers of wind and water. Perhaps the two most noted masonry towers erected on such foundations are the Rothersand Lighthouse, in the North Sea, Holland, and the Fourteen-Foot Bank Lighthouse, in Delaware Bay, United States. To build the foundation for the Rothersand Lighthouse a caisson, in plan resembling a section of a biconvex lens and built of boiler iron, was used. This caisson was 36 feet, 8 inches wide, 46 feet, 8 inches long, and 61 feet, 8 inches high. At a height of 8 feet, 4 inches above the bottom edge of this lenticular shell there was a transverse diaphragm forming the top of the working chamber. Above this diaphragm the caisson was divided into four stories—the lowest for mixing concrete, the second for the machinery installation, the third for sleeping and store rooms, and the fourth for the revolving steam cranes. The three upper floors were suspended from the caisson by screws so that they could be raised as the work progressed. The caisson was built on the shore, towed to its site, and sunk by the pneumatic process to a depth of 73 feet below low water. After being sunk the caisson was surrounded by a brush mattress 3 feet thick for a distance of 50 feet on all sides, to prevent the currents from scouring away the sand. The tower and lantern were then erected, and work was completed in 1885.

The Fourteen-Foot Bank Lighthouse was constructed by means of a pneumatic caisson, as was the Rothersand tower. The caisson proper was made of wood, square in plan, and surmounted by a cylindrical cast-iron shell 35 feet in diameter, which, filled with concrete, formed the light tower. The structure was completed in 1887. Cast-iron, concrete-filled, cylindrical lighthouse towers have been constructed in several locations upon rock foundations. The first cast-iron lighthouse ever erected was at Point Morant, Jamaica, in 1842. The tower was built of nine tiers of plates, ¾ of an inch thick and 10 feet high, held together by bolts and flanges on the inside, and then filled in with masonry and concrete to the height of 27 feet. It rests upon a foundation of granite and rises to a height of 96 feet. It is 18½ feet in diameter at the base and 11 feet at the top.

A form of lighthouse at one time extensively used was constructed on what is called the screw-pile system, an invention of Alexander Mitchell, who with his son laid the foundation of the lighthouse on Maplin Sand at the mouth of the Thames, England. Two similar structures followed, Chapman Head in 1849 and Gunfleet in 1850, also near the mouth of the Thames. Other screw-pile lights were afterward erected in different parts of Great Britain. The great feature of the screw pile is that the piles upon which the structure rests are in the form of screws and are driven in the sand or soil to a sufficient depth in the manner of a corkscrew. The first screw-pile lighthouse erected in the United States was by Col. Hartman Bache, United States Engineer Corps, at Brandywine Shoal, Delaware Bay, 8 miles from the ocean, in 1847–50. This in 1914 was replaced by a reënforced concrete caisson structure. The screw-pile lighthouse at Sand Key, Florida Reefs, is supported on 16 piles, with an auxiliary pile in the centre to support the staircase, making in all 17. They are 8 inches in diameter, with a screw of 2 feet in diameter at the lower ends, which are bored 12 feet into the reef. The framework of the tower consists of cast-iron tubular columns framed together, having wrought-iron ties at each joint and braced diagonally on the faces of each tier. The keeper's house is supported by cast-iron girders and joists 20 feet above the foundation. The focal plane is 109 feet above mean high water. The foundation is 50 feet in diameter.

United States Lighthouse Service. The first lighthouse in North America was built in 1715–16, at the entrance to Boston harbor, by the Province of Massachusetts, and was supported by light dues on all incoming and outgoing vessels, except coasters. Several other lighthouses were built by the Colonies. Congress by the Act of Aug. 7, 1789, authorized the maintenance of lighthouses and other aids to navigation at the expense of the United States. There were at that date eight lights in operation, maintained by the Colonies. These, together with others completed later, 13 in all, were ceded to the general government by the States. The maintenance of lighthouses, buoys, etc., was placed under the Treasury Department and up to 1820 was directed personally by the Secretary of the Treasury, except for two intervals, when supervision was assigned by him to the Commissioner of Revenue. In 1820 the superintendence of the lights devolved upon the Fifth Auditor of the Treasury, who was popularly known as the General Superintendent of Lights, and who continued in charge thereof until 1852, when the United States Lighthouse Board, consisting of officers of the navy and army and civilians, was organized, with the Secretary of the Treasury as ex-officio president of the board. The board selected from its own number a member to act as chairman.

The Lighthouse Service was transferred to the Department of Commerce on July 1, 1903. On July 1, 1910, the Lighthouse Board was terminated, and the present Bureau of Lighthouses established, under the Commissioner of Lighthouses, an officer appointed by the President, whose office is in Washington, which is the executive centre of the service. The service outside of Washington is divided into 19 lighthouse districts, each of which is under the charge of a lighthouse inspector. In each district there is a central office at a location selected on account of either its maritime importance or its geographical position, and there are also one or more lighthouse depots located conveniently for carrying on the work of the district in the matter of storing and distributing supplies and apparatus. Each district is provided with one or more lighthouse tenders for the placing and care of the buoyage system in the district, for distributing supplies to the various light vessels and inaccessible stations, for the transportation of materials for construction and repair when ordinary means are not available, and for transporting the inspector and other officers of the service on official inspections. In addition to the various district depots there is also in New York harbor a general lighthouse depot where many of the supplies for the whole service are purchased and sent out for distribution, and where much of the special apparatus of the service is manufactured or repaired, and where also there is carried on various technical work, such as testing apparatus and supplies and designing or improving apparatus.

The construction of lighthouses in the United States varies greatly. Almost all the usual materials of construction have been employed, such as stone masonry, brickwork, reënforced concrete, framed timber, structural cast iron, structural steel, cast-iron plates, steel plates, and piping. Light stations situated on land sites usually consist of the light tower, oil house, fog-signal building, keepers' dwellings, workshop, water-supply and drainage systems, boathouse and ways, barn, and the usual outbuildings, roads, and walks, although, owing to the restricted area of some sites, one or more or all of the buildings may be combined in one. On submarine sites the whole station is practically confined to one structure.

For land sites, the foundation for a closed tower of masonry, or metal work, is usually a single block of concrete resting upon the foundation soil. Occasionally these blocks are placed upon a timber grillage supported by piles for sites upon low or marshy land. In all cases the block is extended so as to bring the unit pressures within the bearing power of the soil. Occasionally a skeleton structure is placed upon a single foundation block, but usually each column or leg of the tower has its individual block. Where the site is subject to overflow, the buildings are sometimes grouped together, raised upon braced columns and connected by a system of galleries.

For submarine sites, the foundation may consist of a cylindrical cast-iron or sheet-steel caisson filled with concrete, or a masonry pier. Cast-iron caissons are in general use on the Atlantic coast. When placed upon a ledge of rock, the latter is usually leveled up with concrete bags if below low water, or with tools if exposed, and the ledge or rock is then heavily ragbolted to the concrete filling. For soft bottom, the best method of procedure is to float the caisson out and sink it by the pneumatic process. Both timber and metal-working chambers have been used, and the depths from the cutting edge to high water have varied from 19 to 85 feet. Other foundations, consisting of timber cribs and concrete blocks, used in fresh water, have been placed either directly on good existing bottom or upon a layer of small rock, usually 3 or 4 feet thick, deposited upon the soft or dredged bottom prior to floating the crib out. These timber cribs are usually filled with stone and terminate about 2 feet below low-water level; the concrete blocks are then placed to the height of the deck.

Structures upon land sites are exposed to wind pressures and occasionally to waves in addition. Those upon submarine sites are exposed to wind, wave, currents, and ice. The usual procedure in determining the stability of tower is to locate the common centre of effort of all the forces acting upon the structure to overturn it and so proportion the weights of the entire structure (the buoyancy of the water must be taken into account for submarine structures) that the resultant of the active forces and the net weight falls so far within the outer edge of the base that there is compression over its whole surface if the foundation soil is compressible. In seeking for this result it is proper to include the lateral resistance of the soil when the structure penetrates it for some distance for the reason that it is often heavily compressed by a large deposit of riprap and offers good support. The maximum unit pressures, both vertical and lateral, must not exceed the bearing power of the soil. In case the foundation is rock, the resultant must fall so far within the outer edge of the base that the maximum unit pressure does not exceed the compressive strength of the materials in contact.

The wind, wave, current, and ice pressures assumed should be the maximum in each instance, as lighthouses are commonly exposed to severe gales and flows of ice. It has been the practice to assume wind pressure for flat surfaces at 60 pounds per square foot, allowing two-thirds of this figure for rotundity. Maximum wave pressures of 6000 pounds per square foot on flat surfaces are assumed, based upon Stevenson's experiments, the force of the wave being greatest at its crest and diminishing to zero at its base. The pressures exerted by currents vary with their rate of speed. The pressures due to ice have been assumed at 30,000 pounds per square foot for a field of melting ice, 1 foot thick, striking the pier and crushing its way past.

The superstructures of all towers, whether separate or combined with other buildings, have certain features in common. There is a main entrance door at the base, a flight of winding stairs, broken by landings in high structures, leading to the service room, which in the larger lights is usually separated by an air lock from the watch room above, the latter supporting the lantern. Occasionally in large lights and usually in small ones the service and watch rooms are combined. The pedestal of the illuminating apparatus usually rests upon the watch-room floor, but in the small lights the lantern floor supports it. The clear glazed opening of the lantern is just sufficient to pass the horizontal rays from the illuminating apparatus, and if the latter is of a revolving type, showing flashes or occultations, the newel post of the tower serves as a weight shaft for the clock. There are railed galleries outside both lantern and watch room. The tower should be thoroughly fireproof and isolated in this respect from the other buildings. For calculating the strength of closed and skeleton towers the manner prescribed for chimneys and viaduct bents is employed, with the exception that great stiffness and rigidity must be provided, as vibrations are detrimental to the proper working of the lamps and clocks of the illuminating apparatus.

Lighthouse Illumination. In considering the ranges of visibility both the geographical range of the light due to its height above sea level and the luminous intensity of the light emitted by the illuminating apparatus must be taken into account. The geographical range, or the distance corresponding to the height, may be found approximately by the formula $D = \frac{8}{7}\sqrt{H}$, in which $H =$ the elevation, or height, in feet, of the object above sea level, and $D =$ the corresponding distance of visibility, in nautical miles. The formula is based on the mean curvature of the earth and is corrected for ordinary atmospheric refraction and should be used only for moderate distances and elevations. The intensity of a light as observed, affecting the luminous range, may be greatly lessened, or the light may be made invisible by unfavorable conditions due to fog, haze, rain, or smoke.

Lights have hitherto been classified according to their order. The order of a light depends upon the inside radius, or focal distance of the lens, i.e., the distance from the centre of the light to the inner surface of the lens, but does not apply to ordinary metallic or glass reflectors, nor to unclassified lenses smaller than 6th-order illuminating apparatus. The table on the following page shows the focal distances of standard sizes of illuminating apparatus. There are also miscellaneous smaller lights for less important localities. The power of the lights does not vary directly with the order excepting where the apparatus and illuminant are similar. The designation of lights by orders is therefore somewhat obsolete, and recent practice in the United States substitutes the candle power of the light, from which the mariner may more readily judge of the relative brilliancy and power of the various lights.

Illuminating apparatus is, as a rule, of three general characters, viz., catoptric or reflecting, dioptric or refracting, and catadioptric, in which the lenticular apparatus is provided with both reflecting and refracting media. The latter type is the most in use. In the *catoptric* or *reflecting system* all of those rays proceeding from the focus of a parabolic mirror which fall upon its surface are reflected parallel to the axis so as to form a solid beam of light. As the property of the parabolic reflector is to collect the rays incident upon its surface into one beam of parallel rays, it would be absolutely impossible, were the flame from which the rays proceeded a mathematical point, to produce a light which would illuminate the whole of the horizon, unless there were an infinite number of reflectors. (See PARABOLA.) But as the radiant, instead of being a mathematical point, is a physical object, consisting of a flame of appreciable size, the rays which come from the outer portion of the luminous cone proceed, after reflection, in such divergent directions as to render it practically possible to light up, though unequally, the whole horizon. The distinction of a red light is produced by using a chimney of red instead of white glass for each burner.

	Millimeters	Inches
1st order	920	36.2
2d order	700	27.6
3d order	500	19.7
3½ order	375	14.7
4th order	250	9.8
5th order	187.5	7.4
6th order	150	5.9

The *flashing* light, giving, by revolutions of the lens, flashes at prescribed intervals, which is one of the most striking of all the distinctions, was first introduced by Robert Stevenson, the well-known lighthouse engineer, in 1822, at Rhinns of Islay in Argyllshire. The same engineer also introduced what has been called the *intermittent*, now known as occulting, light, by which a stationary frame with reflectors is instantaneously eclipsed and is again as suddenly revealed to view by the vertical movement of opaque cylinders in front of the reflectors. The intermittent is distinguished from the revolving light, which also appears and disappears successively to the view, by the suddenness of the eclipses and of the reappearances, whereas in all revolving lights there is a gradual waxing and waning of the light. Wilson introduced at Troon harbor an intermittent light which was produced by a beautifully simple contrivance for suddenly lowering and raising a gas flame. Stevenson proposed an intermittent light of *unequal periods* by causing unequal sectors of a spherical mirror to revolve between the flame and a fixed dioptric apparatus (such as that shown in Fig. 3). The power of the light is increased by the action of the spherical mirror, which also acts as a mask in the opposite azimuths.

Another method of bending the divergent rays proceeding from a lamp into such directions as shall be useful to the mariner is that of *refraction*, known as the *dioptric system*. If a flame be placed in the focus of a lens of the proper form, the diverging rays will be bent parallel to each other, so as to form a single solid beam of light. Fresnel was the first to propose and to introduce lenticular action into lighthouse illumination, by the adoption of the annular or built lens, which had been suggested as a burning instrument by Buffon and Condorcet. He also, in conjunction with Arago and Mathieu, used a large lamp having four concentric wicks. In order to produce a *flashing* light on the lenticular or dioptric system, a different arrangement was adopted from that already described for the catoptric system. The large lamp was now made a fixture, and four or more annular lenses were fitted together, so as to form a frame of glass which surrounded the lamp. When this frame is made to revolve around the lamp, the mariner gets the full effect of the lens whenever its axis is pointed towards him, and this full light fades gradually into darkness as the axis of the lens passes from him. In order to operate on those rays of light which passed above the lens, a system of double *optical* agents was employed by Fresnel. These consisted of a pyramid of lenses with mirrors placed above at the proper angle for rendering the rays passing upward parallel to those which came from the annular lens. But Fresnel did not stop here, for, in order to make the lenticular system suitable for fixed as well as revolving lights, he designed a new optical agent, to which the name of *cylinder refractor* was given. This consists of cylindrical lenses, which were the solids that would be generated were the middle vertical profile of an annular lens made to revolve around a vertical axis. The action of this instrument is obviously, while allowing the rays to spread naturally in the horizontal plane, to suffer refraction in the vertical plane. The effect of this instrument is, therefore, to show a light of equal intensity constantly all around the horizon and thus to form a better and more equal light than that which was formerly produced for fixed lights by parabolic reflection. It is obvious, however, from our description that the diverging rays which were not intercepted by this cylindric hoop, or those which would have passed upward and been uselessly expended in illuminating the clouds, or downward in uselessly illuminating the light-room floor, were lost to the mariner; and to render these effective Fresnel ultimately adopted the use of what has been called the internal or total reflection of glass; and here it is necessary to explain that one of the great advantages of internal reflection by glass over metal is the smaller quantity of light that is absorbed. It has been ascertained that there is a gain of nearly one-fourth (0.249) by employing glass prisms instead of metallic reflectors for lighthouse illumination. There were introduced above and below the cylindric refracting drum separate glass prisms of triangular section, the first surface of each of which refracted to a certain extent any ray of light which fell upon it, while the second surface was placed at such an angle as to reflect, by total reflections, the ray which had before been refracted by the first surface; and the last or outer surface produced another refraction, which made the rays finally pass out parallel with those refracted by the central cylindric drum. The light falling above the cylindric drum was thus by refractions and reflections bent downward, and that falling below was bent upward, so as to be made horizontal and parallel with that proceeding from the refracting drum. Fig. 3 represents in vertical section this, which is the most perfect of Fresnel's inventions in lighthouse illumination, especially when made in pieces of the rhomboidal form and used in connection with a diagonal framing introduced by Allan Stevenson. In Fig. 3 *p* shows the refracting and totally reflecting prisms, *r* the cylindric refractor, and *f* the radiant. From what has been stated, it will be readily seen that, in so far as regards fixed lights, which are required to illuminate *constantly* the whole of the horizon with equal intensity, the dioptric light of Fresnel with Allan Stevenson's improvements is an improved instrument. But the case is different as regards revolving lights, or those where the whole rays have to be concentrated into one or more beams of parallel rays. To revert to the parabolic reflector, it must be obvious that all rays which escape past the lips of the reflector never reach the eye of the mariner, while, if we return to the dioptric revolving light of Fresnel, we find that those rays which escape past the lens are acted on by *two* agents, both of which cause loss of light by absorption. The loss occasioned by the inclined mirrors and in passing through the pyramidal inclined lenses was estimated by Fresnel himself at *one-half* of the whole incident rays. In order to avoid this loss of light Thomas Stevenson proposed in 1849 to introduce an arrangement by which the use of one of these agents is avoided, and the employment of the total reflection which had been successfully employed by Fresnel for fixed lights was introduced with great advantage for revolving lights. He combined an annular lens, *L* (Fig. 4); a parabolic conoid, *a*, truncated, at its parameter, or between that and its vertex; and a portion of a spherical mirror, *b*. The lens and mirror were placed at the proper focal distance from the flame, so that all the rays of light coming from the front of the flame were intercepted either by the paraboloid or the lens. The rays emanating from the flame may be regarded as divided into two hemispheres. The lens intercepts part of the anterior hemisphere of rays and makes them parallel, while the remainder fall on the paraboloidal surface and are reflected parallel. The rays forming the posterior hemisphere falling on the spherical mirror are reflected forward again through the focus in the same lines, but in opposite directions to those in which they came, and then are in part refracted by the lens, and the rest are made parallel by the paraboloid. The result is that rays finally coming from the posterior hemisphere emerge horizontally combined with those from the anterior hemisphere. Thus the entire sphere of diverging rays is collected into one beam of parallel rays without employing any unnecessary agents.

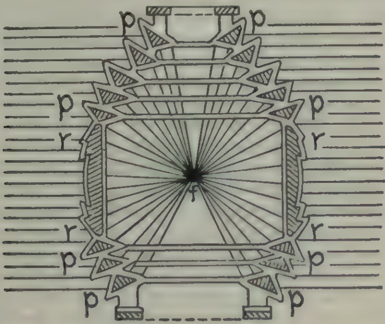


FIG. 3. VERTICAL SECTION OF FRESNEL SYSTEM.

What has been just described was termed by Stevenson a *holophote*. What follows is a description of the *catadioptric* system in which total reflection is the underlying principle. The front half of the rays is operated upon by totally reflecting glass prisms, similar in section to those applied by Fresnel for fixed lights; but, instead of being curvilinear in the horizontal plane only, they are also curvilinear in the vertical plane and thus produce, in union with an annular lens, a beam of parallel rays similar to what is produced by the parabolic mirror. The rays proceeding backward fall upon glass prisms, which produce two reflections upon each ray and cause it to pass back through the flame, so as to fall ultimately in the proper direction upon the dioptric holophote in front, so that the whole of the light proceeding from the flame is thus ultimately parallelized by means of the smallest number and the best kind of optical agents. It is a remarkable property of the spherical mirror that no ray passes *through* it, so that an observer, standing behind the instrument, perceives no light, though there is nothing between him and the flame but a screen of transparent glass. Where the light is produced by great central stationary burners, the apparatus assumes the form of a polygonal frame, consisting of sectors of lenses and holophotal prisms, which revolves round the flame, and each face of which produces a beam of parallel rays. Hence, when the frame revolves round the central flame, the mariner is alternately illuminated and left in darkness, according as the axis of each successive face is pointed towards him or from him. In the revolving holophotal light one agent is enabled to do the work of two agents in the revolving light of Fresnel, as total reflection, or that by which least light is lost, is substituted for metallic reflection. The catadioptric holophotal system, or that by which total reflection is used as a portion of the revolving apparatus, was first employed on a small scale in 1850 at the Horsburg Lighthouse, and on a large scale in 1851 at North Ronaldshay in Orkney. Since that date this system has been all but universally introduced into Europe and America.

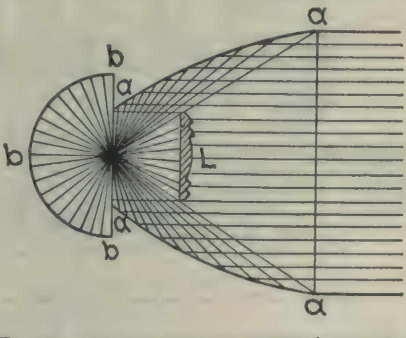
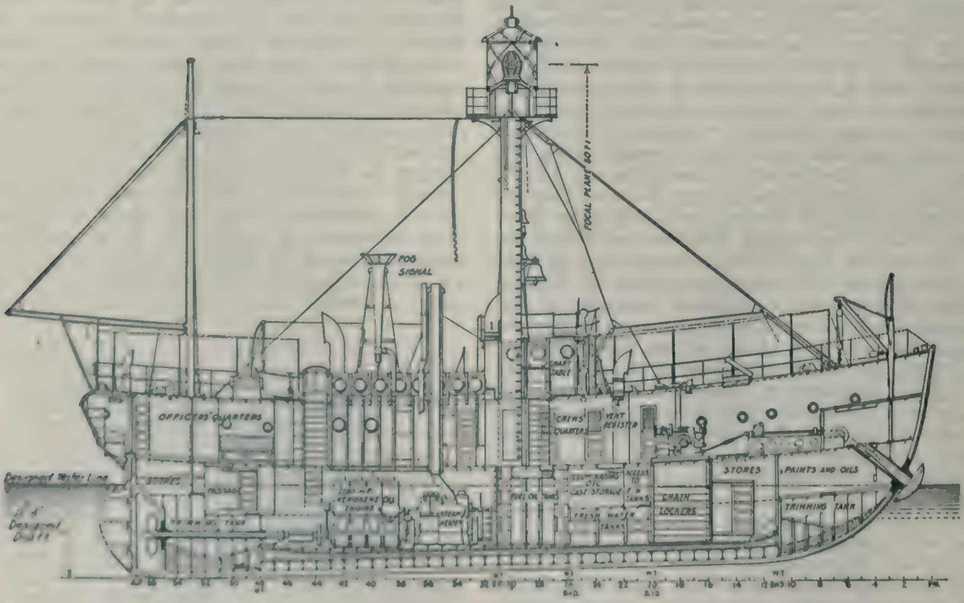


FIG. 4. PLAN OF THOMAS STEVENSON'S SYSTEM.

Much of the coast of the United States was lighted before the introduction of modern lighthouse apparatus, and therefore the older lights were in general fixed lights. The more important of these have been replaced by flashing or occulting apparatus, and such improvements are being made continuously from time to time. The more common characteristics of lights are as follows: *fixed,* continuous steady light; *flashing,* showing a single flash at regular intervals, or a steady light with total eclipses; *fixed and flashing,* a fixed light varied at regular intervals by a single flash of greater brilliance—the flash is preceded and followed by a diminution of light or an eclipse; *group flashing,* showing at regular intervals groups of flashes; *occulting,* a steady light suddenly and totally eclipsed at regular intervals; *group occulting,* a steady light suddenly and totally eclipsed by a group of two or more eclipses. Lights are characterized as flashing or occulting solely according to the relative duration of light and darkness, and without reference to the type of illuminating apparatus employed or relative brilliancy, a flash being shorter than the duration of an eclipse, and an occultation shorter than or equal to the duration of light.

All of the foregoing applies more particularly to lights which do not change color, but other combinations may be obtained by showing alternately white and colored lights in various sequences. Such lights are known as alternating. Such lights of alternating colors should be so designed that the white and colored rays are of equal intensity. In modern practice fixed lights are, if practicable, usually avoided for important stations on account of the liability of confusion with neighboring private lights. Fixed and flashing lights and lights with prolonged flashes are also generally avoided, for the reason that the fixed and prolonged rays emitted by the lenticular apparatus are of less intensity than those of the flashes, giving a variable characteristic on account of the difference of luminous range, which may be misleading at the outer limit of visibility. In former times twin or other multiple lights were used for distinguishing purposes; but they are now considered obsolete, as they largely increase the cost of maintenance and are less distinctive than flashing lights.



DESIGN FOR UNITED STATES LIGHT VESSELS FOR USE ON ATLANTIC COAST. (From *Engineering News.*)

Fog Signals are devices employed to give warning during fog or thick weather when lights are obscured, and are installed at all important light stations. They consist in general of some sound-producing apparatus arranged to give a definite number of strokes or blasts per minute or other unit of time. Fog signals are either bells struck by hand or machinery, submarine bells struck by machinery, or whistles, reed horns, or sirens blown by compressed air or steam. Aërial fog signals are subject to some uncertainty, as sound is conveyed irregularly through the atmosphere, and it is not always possible to judge distance from a fog signal by the power of the sound. Under certain conditions of the atmosphere the sound may be lost a short distance from the station, as there may be silent areas or zones, or the sound may carry much farther in one direction than in another, and these conditions may vary in the same locality within short intervals of time. Submarine signals have, as a rule, a more uniform and effective range of audibility, but these are sometimes affected by irregularity of the sea bottom.

Light Vessels are vessels fitted with lights moored at sea at important points off the coast, the approaches to harbors, or in the vicinity of reefs, where it is not feasible to erect lighthouses. Prior to 1807 the lantern was hung at the yard-arm. Robert Stevenson then introduced a system of lanterns, grouped around a copper tube around the vessel's mast, which passed through the tube. In this way proper optical appliances could be employed, and the lantern lowered on the mast so as to pass through the roof of a house on the deck, where the lamps are filled or trimmed. In 1864 six floating lights were constructed for the Hugli under the direction of the Messrs. Stevenson, in which the dioptric principle was applied. Eight suspended lamps with spherical mirrors behind were placed in the lantern round the mast so as to show in every azimuth rays from three of them at once. In 1914 the United States maintained light vessels on 52 stations and had for this purpose 66 light vessels, of which 14 were relief vessels. Recent light vessels carry one steel lantern mast of a diameter sufficient to contain a ladder giving access to the lantern, in which is housed lenticular apparatus similar to that used in lighthouses. Modern light vessels for exposed stations are also provided with full power-propelling machinery and fitted throughout with all modern appliances, such as steam windlass, sanitary plumbing and fixtures, electric-lighting system, and radiotelegraph. Light vessels are also equipped with powerful fog signals and bear on the sides a brief marking name in large letters to insure maximum visibility. Light vessels on United States coast stations also display the International Code Signal of their station whenever a vessel is approaching or in the vicinity and there are indications that such vessel is in strange waters or fails to recognize the station, or when the vessel asks for the information.

Sources of Light. The illuminant of the United States Lighthouse Service has been changed frequently. Fires in open braziers and tallow candles were used in early lighthouses abroad, but oil lamps were soon used in America, if not from the first lighting of Boston Light. Tallow candles were used at Boston harbor in 1716. Fish oil was burned in spider lamps, and afterward sperm oil was burned in a sort of argand lamp in Winslow's magnifying and reflecting lanterns, which remained in use up to the time of the establishment of the Lighthouse Board. As sperm oil became more and more expensive, the attention of the board was directed to finding cheaper illuminant, and it was found that colza, the oil expressed from the seeds of wild cabbage and several other plants, which was largely used in France and Great Britain, would fulfill all the conditions except that of being of home production. This was overcome by stimulating the cultivation of the plants and the manufacture of the oil from the seeds as a private industry. Further experiments with lard oil were made, with such process as to prove that the latter oil of a certain grade was a more desirable illuminant than colza, as it was more certain in quantity and production and was more economical in price. This became the next established illuminant. The use of petroleum had attracted attention for a long time, and in 1855 the United States Lighthouse Board made some unsuccessful experiments with it. Meantime the price of lard oil had so increased that some other illuminant became a necessity, and, as kerosene in one form or another was in successful use in European lighthouses, the board renewed its experiments with petroleum. The first difficulty was that of the lamp in which it should be burned. This was finally overcome by the board, which succeeded in producing a lamp in its own laboratory that proved satisfactory and that was introduced into the lighthouses. Practically all of the important coast stations now use kerosene as the illuminant, by means of the incandescent oil-vapor system. The plant at each station consists, briefly, of a tank containing the kerosene under high air pressure maintained by hand pump and the proper tubing through which the oil is forced from the tank to the lamp, which consists of a vaporizer, Bunsen burner, and a mantle under which the vaporized oil is burned, producing a brilliant incandescence. Other forms of illuminant are also used in selected localities, such as compressed-oil gas or acetylene, and self-generating acetylene apparatus by the use of calcium carbide. Electric light is also used when conditions warrant, and the most powerful light now maintained by the United States Lighthouse Service is that at Navesink, at the entrance to New York Bay, which consists of an electric arc exhibited through a modern lenticular apparatus, giving a white flash every five seconds, with an estimated candle power of 25,000,000.

Buoys. Buoys are extensively used for marking channels, dangerous and salient points. In the United States the following order is prescribed by law for the coloring and numbering of buoys along the coasts or in bays or channels, viz., in approaching from the seaward red buoys with even numbers will be found on the starboard (right) side, and black buoys with odd numbers on the port (left) side. Buoys painted with red and black horizontal stripes will be found on obstructions, with channel ways on either side of them, and may be left on either hand when passing in. Buoys painted with black and white perpendicular stripes will be found in mid-channel and to avoid danger should be passed close to. In recent years the application of gas as an illuminant has greatly extended the usefulness of lighted buoys. Buoys with sound signals are also of value and are used in connection with either lighted or unlighted buoys. These are either whistling or bell buoys and are sounded automatically by the action of the sea. Therefore in calm weather they are less effective and at times may not be heard.

Lighted Beacons. Recent improvements in the United States Lighthouse Service have been made by the introduction of non-attended beacon lights, burning acetylene or oil gas stored in suitable containers under pressure. A flashing mechanism in the lantern, operated by the pressure of the gas, may be adjusted to give the light and dark periods desired, in connection with a small pilot light which burns continuously. As a rule, such lights require attention at periods varying from three months to a year and are therefore of value in remote localities, as they dispense with the necessity of keepers.

Statistics. The number of aids to navigation maintained by the United States Lighthouse Service on June 30, 1914, is shown in the following table:

Lighted aids:	
Lights (other than minor lights)	1,590
Minor lights	2,791
Light-vessel stations	52
Gas buoys	453
Float lights	118
Total	5,004
Unlighted aids:	
Fog signals	519
Submarine signals	48
Whistling buoys, unlighted	86
Bell buoys, unlighted	233
Other buoys	6,330
Day beacons	1,978
Total	9,194
Grand total	14,198

Bibliography. David Stevenson, *Lighthouses* (Edinburgh, 1864); Elliot, *European Light House Systems* (Washington, 1876); Léonce Reynaud, *Memoir upon the Illumination and Beaconage of the Coasts of France*, translated by Harris (ib., 1876); Thomas Stevenson, *Lighthouse Construction and Illumination* (London, 1881); Emile Allard, *Les phares* (Paris, 1889); A. B. Johnson, *Modern Light House Service* (Washington, 1889); D. P. Heap, *Ancient and Modern Light Houses* (Boston, 1889); International Maritime Congress, London, *Lighthouses, Buoys, Fog-Signals, etc.* (London, 1893); H. D. Jenkins (comp.), *The Lights and Tides of the World, Including a Description of all the Fog-Signals* (London, 1900, Supp., 1901–03); J. F. Chance, *Light House Work of Sir James Chance* (ib., 1902); Ribière, *Phares et signaux maritimes* (Paris, 1908); J. S. Wryde, *British Lighthouses: Their History and Romance* (London, 1913), containing a bibliography; F. A. Talbot, *Lightships and Lighthouses* (ib., 1913); also articles in *The Engineer* (ib., annually); *Engineering* (ib., 1866, annually).

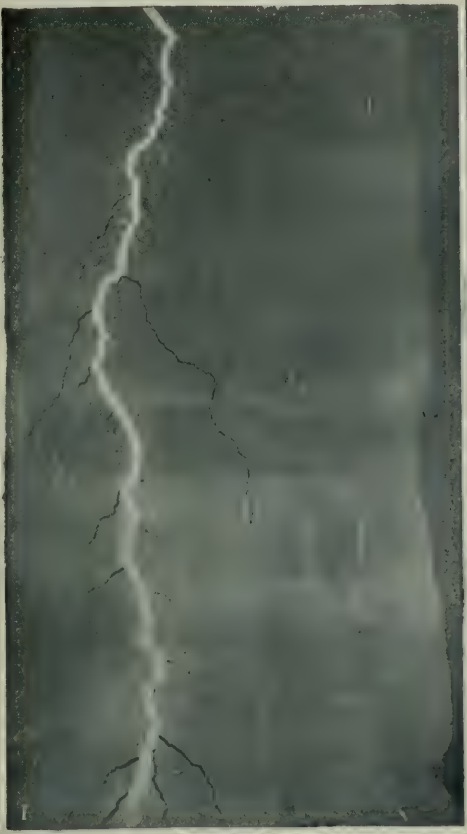
LIGHTHOUSE BUREAU. See LIGHTHOUSE.

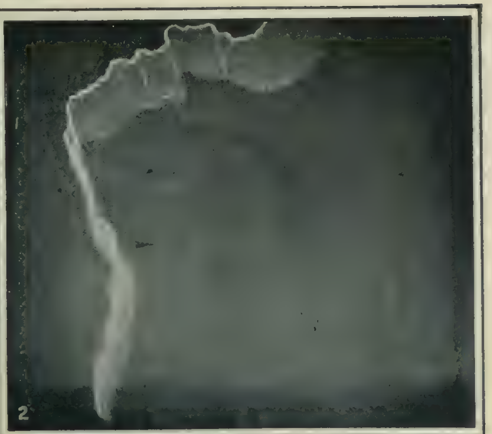
LIGHT'NING (ME. *lightnyng*, illumination, from *lighten*, light). A brilliant flash of light between clouds or between a cloud and the earth. These flashes were shown by Benjamin Franklin to be simply enormous electrical discharges. The length of such a flash may be several miles. When the flashes are between the lower clouds and the earth, they are comparatively narrow and brilliant and are accompanied by thunder, but when they take place in the upper cloud region they become more diffuse, and thunder is rarely heard. Three general classes of lightning are recognized. The first of these is popularly and generally designated *forked, zigzag*, or *chain lightning*, which is a line of light of intense brilliancy, appearing to the eye as a single blinding streak of light, which sometimes breaks into one or two branches and is often a rosy or violet tint. Photography discloses, however, that the line of light is never actually zigzag, but is always instead of an irregular sinuous character. The second class of lightning is called *sheet lightning;* this has no definite form. It is generally of a rosy or red tint and appears in the distant horizon lighting up the clouds, dust, or haze in the atmosphere. The ordinary appearance of sheet lightning is very common, being due to the illumination of the clouds and haze by flashes of lightning which may be beyond the horizon, or concealed from direct view by intervening clouds, and thus become manifest although at a great distance. The third kind of lightning is the so-called *ball lightning*, which is said to appear like a small globe of brilliant light moving slowly through the air at a short distance above the ground or even rolling along the ground itself. Reliable observers have stated that on some occasions ball lightning has been seen to roll slowly into a house through an open door or window; it generally breaks up with an explosion, which, however, is not very destructive or dangerous. The descriptions of this phenomenon present many points difficult to understand, and it is only of late years that electricians have been willing to admit that we have here a true but peculiar form of electric discharge that demands further experimental investigation. Very minute discharges analogous to ball lightning have been produced in the physical laboratory. The silent electric discharges known as St. Elmo's fire (q.v.) are not usually included under lightning.

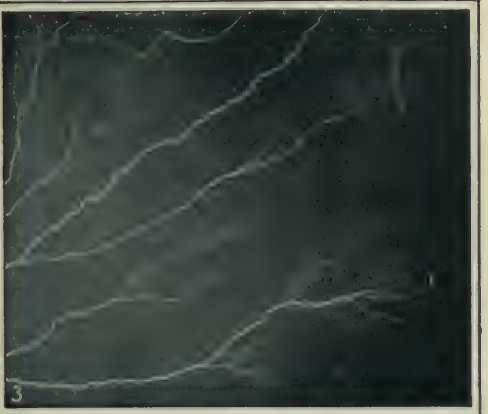
The thunder that accompanies lightning seems to be satisfactorily explained by the fact that the electric discharge in forcing its way through the atmosphere heats the air and the vapor lying in its path to a very high temperature, causing a very violent expansion along the whole length of the flash. The result is a very steep compression wave or, what is the same thing, a noise. Rapid cooling undoubtedly follows the heating, but the cooling is the less rapid and probably is not involved in the noise of thunder. Owing to the refraction of sound as it travels through the atmosphere, and especially the irregular refraction due to the temperature and wind, thunder does not travel very far before it begins to rise above the ground, so that observers frequently see flashes of lightning without hearing the thunder which has passed over their heads. Thunder is therefore rarely heard at a distance of 15 or 20 miles, whereas discharges of artillery may be heard 30, 50 or 100 miles.

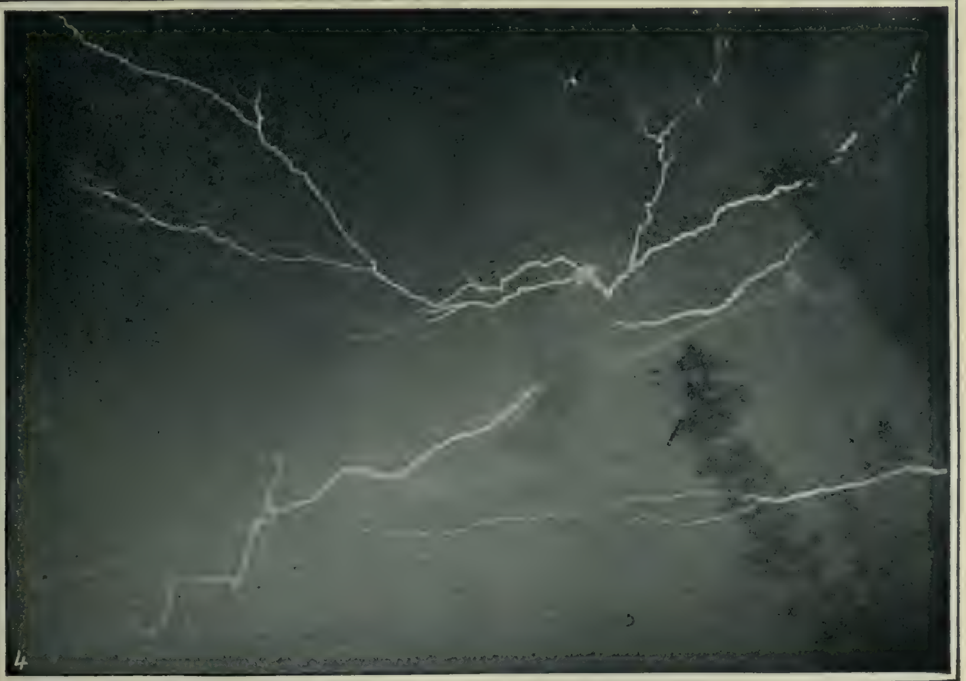
Beginning with the researches of the late Prof. Ogden N. Rood, of Columbia College, and with the results obtained from the recent applications of photography, a few definite facts have been added to our knowledge of the nature of lightning. Professor Rood was able to show that a so-called single flash which may last several tenths of a second is simply an irregular succession of elementary flashes each of which lasts but a few thousandths of a second, or even less. Prof. John Trowbridge, of Harvard University, has constructed a storage battery of minute cells, by means of which he has been able to imitate true lightning flashes of several yards in length. Prof. Joseph Henry was able to show that all electric discharges are of an oscillating or alternating nature. The individual oscillations take place in a few millionths of a second and rapidly die away in intensity, so that the whole discharge is accomplished in a very short time, depending on the size and distance of the electrified bodies. Now, as lightning is evidently a simultaneous discharge from myriads of electrified drops towards numerous spots on the earth's surface, or towards a similar electrified cloud at a distance, it is therefore a rational hypothesis to assume that the numerous discharges observed by Rood as constituting one flash were simply a grand example of Henry's oscillatory discharges. The truth of this hypothesis seems to be confirmed by many photographs of lightning that have been taken within the past 15 years. Some good arguments against the oscillatory and favoring the direct character of lightning have been revealed recently by photographs with moving cameras, and the oscillograph. The latter instrument has not yet finally proved lightning to be oscillatory. (Consult Marvin, in *Monthly Weather Review*, vol. xiv, Washington, 1914.) Photographs of lightning sometimes show a dark flash among the bright ones, but this is now known to be a photochemical effect on the sensitive plate and not an electrical or atmospheric one. A fine example is shown in Fig. 1: The phenomenon is known as the "Clayden effect." Consult A. W. Clayden, *Philosophical Magazine*, vol. xxviii, also R. W. Wood, *Science*, vol. x. Wood shows that when a very intense flash of light acts upon a photo-

LIGHTNING

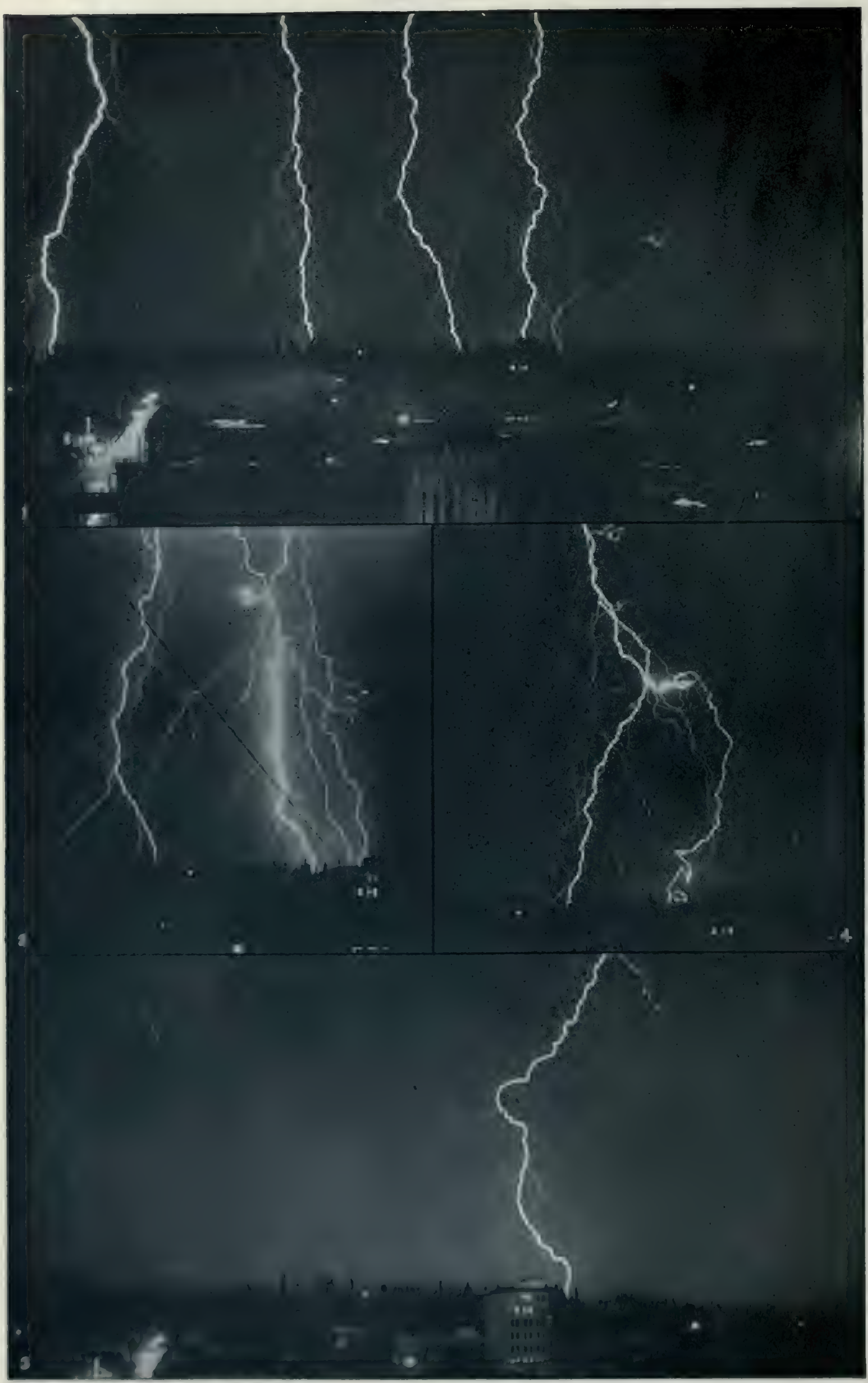








1. SO-CALLED "BLACK FLASH" OF LIGHTNING, photographed July 17, 1910, Little Rock, Ark., by Franklin Henshaw
2. RIBBON FLASH OF LIGHTNING, on Prairie of North Dakota, photographed Aug. 12, 1892, by W. N. Jennings.
3. BRANCHED or TREE LIGHTNING, photographed May 16, 1892, Philadelphia, Pa., by W. N. Jennings.
4. BRANCHED or TREE LIGHTNING, photographed May 18, 1898, Osage City, Kansas, by Charles O. Leo.



Photographs Copyright 1914 by C. R. Lewis.

PHOTOGRAPHS OF LIGHTNING MADE AT SPOKANE, BY C. R. LEWIS, JULY 13, 1914

1. Photographic record of four probably simultaneous flashes secured at one exposure.
2. Photograph made subsequent to No. 1 from same point of view.
3. A later flash.
4. A still later flash.

In each case the shutter of the camera remained open from two to several minutes before any flash was observed and was then instantly closed.

graphic plate for a very short time (one fifty-thousandth of a second in actual experiments) and the plate is subsequently slightly fogged by short exposure to a feeble light (candle or equivalent) the image of the flash will be reversed and *in the print* will appear darker than the background. The branches and fainter flashes in some lightning prints therefore appear dark.

A good example of ribbon lightning is shown in Fig. 2. Such a ribbon might be due to unintentional displacement of the camera during the flash. Undoubtedly many reported cases may be thus explained away, but there remain a number of authentic ribbon-lightning records.

Two distinct explanations have been offered of authentic multiple flashes as seen in photographs. According to one, the first flash makes, as it were, a hole in the air, and succeeding discharges quickly pass up and down through this tube, while the general wind of the atmosphere carries it along for a few feet. According to the other explanation, the hole or tube of rarefied air lasts so short a time that the motion of the wind is inappreciable, but it is of such a great diameter that the successive discharges passing up and down within it side by side, or one within the other, appear as separate streaks of light. Neither of these explanations can be said to be satisfactory. Somewhat similar flashes can be produced artificially by blowing across a discharge between two electrodes.

The researches of Trowbridge and others have shown that the resistance of atmospheric air to electrical discharges becomes less as the voltage increases beyond some high number such as a million volts. Discharges in rapid succession from the same points progressively ionize a path which when completed conducts the perfect lightning spark. This has been beautifully demonstrated with the aid of a moving camera, by Walter, of Hamburg, and Larsen, of Chicago. Under powerful electric stress a resisting medium seems completely to lose its power of resistance and is immediately ruptured.

The frequency of occurrence of lightning and thunderstorms was published regularly in the *United States Monthly Weather Review* for a number of years, and the annual summary shows that the number of days on which thunderstorms were reported varies from 100 at any station in Louisiana and Florida to 5 or even 1 per annum at special stations in Arizona, California, Maine, Nevada, North Dakota, Oregon, and Washington. It is suspected that there is some relation between the aurora and the lightning, since on many occasions numerous thunderstorms have been recorded around a central region where clear skies and auroras were observed. Consult: Sir Oliver Lodge, *Lightning Conductors and Lightning Guards* (London, 1892); Alexander McAdie, "Lightning and Electricity of the Air," in *United States Weather Bureau, Bulletin No. 26* (Washington, 1899); W. J. Humphrey, in the *Monthly Weather Review*, vol. xlii (ib., 1914), where is given a list of important papers. See TERRESTRIAL ELECTRICITY.

LIGHTNING, ACCIDENTS FROM. Statistics have been kept for many years, both in Europe and America, showing the frequency of lightning strokes and the destruction done by them. Thus, according to the report of the Registrar-General for England, in 1871, 28 persons were killed; all but 5 were men and were chiefly laborers in the open air. In 1875, 17 were killed, and in 1877 only 10. Out of 103 deaths in five years (1852–56) there were 38 in July and 22 in August. According to Hellmann, in Schleswig-Holstein, during the decade 1874–83 the annual average of destructive lightning strokes per million of buildings was 163 for slate or metal roofs, 386 for wooden or thatched roofs, 6277 for chimneys, 8524 for windmills, and 306 for factories and steam chimneys. The danger to buildings in the open country is five times greater than in the cities. The number of deaths of human beings on the average of 15 years per million is 4 in Prussia and Baden and 3 in France and Sweden. The danger to buildings erected on chalk or marl is very small, but on clay or sand larger. Among forest trees the oak is most frequently struck and the beech least frequently. The records from 1833 to 1882, according to Von Bezold, show that there is a steady increase in the recorded number of strokes; possibly this may be explained by the increased care in collecting data. According to Prof. A. J. Henry, the records of the United States Weather Bureau show that during 1898 throughout the United States, excluding Alaska, the number of deaths by lightning was 367, and the number of injuries 491. The proportion of deaths to the population was greatest in the upper Missouri valley and portions of the Rocky Mountain region. The proportion of deaths by lightning to the total population was about 5 per million, which is higher than the average of most countries, owing to the large proportion of the agricultural population. Nine hundred and sixty-six barns or sheds, 735 dwellings, stores, or offices, 95 churches and schools, and 70 other buildings were struck and damaged, the approximate loss being about $1,500,000. Of the buildings struck 40 were provided with lightning rods, 855 were not; and in 952 cases this item was not recorded. Nine hundred and sixty-four head of cattle, 306 horses, 30 mules, 426 sheep, 116 hogs were killed, the total value of the stock being $48,257. The continuous barbed-wire fences that are used over the Western prairies are said to increase greatly the number of cattle killed by lightning, as these seek shelter in some corner of the field, and the lightning runs to them along the wire from very considerable distances. Consult A. J. Henry, "Loss of Life in the United States by Lightning," in *United States Weather Bureau, Bulletin No. 30* (Washington, 1901), and A. J. Jex-Blake, "Death by Electric Currents and by Lightning," in *British Medical Journal* (London, 1913).

LIGHTNING, PROTECTION FROM. When a flash of lightning strikes any object on the ground, it generally does some destruction, apparently owing to the fact that when the electric discharge passes through a poor conductor it heats that substance intensely. Thus, when a discharge passes through a living tree all the sap may be converted into vapor and all the passages filled with air or filled with sap burst open. When the flash strikes a shingle roof, it sets fire to the wood, or, striking the chimney of a house, it expands the air within the brickwork or evaporates the water in the cracks and thus breaks up the chimney by the explosion. When the discharge runs along the roots of a tree or an underground drain, it tears up the ground by the force of the explosive expansion of the water.

In general, perfect protection from a destructive flash can only be obtained by surrounding an object with a continuous metallic covering. This need not necessarily be a metal box, but may consist of a network of wire, or even a few metallic rods properly interconnected and the system thoroughly connected to the damp earth by being deeply embedded therein. For an ordinary building the rods should run vertically up and down each of the corners and horizontally along the ridge, the eaves, and every other edge or prominence on the roof; these are the exposed portions, and if they are well protected there is but slight chance that a flash will strike the building elsewhere. A partial protection is of course provided for by a single metallic wire or so-called lightning rod, especially if the upper end protrudes far above the building, but it is quite deceptive to suppose that any definite rule can be offered for calculating the so-called area of protection.

The conductors usually found on buildings have as their terminals sharp cones or prongs of copper which are gilded to protect the points and to prevent corrosion, while the conductors themselves are generally in the form of a metal rod, rope, or ribbon, and terminate either in plates buried in damp ground or by making connection with water or gas pipes. Modern authorities agree that the more points along the ridges and eaves of a roof, the greater the amount of safety, and these of course should point to the sky. A factory chimney or steeple in the neighborhood is apt to attract the lightning and in all cases should be protected by conductors, as it may be a source of danger to surrounding buildings and not a safeguard, as is commonly supposed. The lightning conductor should be of iron or copper, and if the latter material is employed, it is considered advantageous to use it in the form of bands or ribbons, but stranded copper-wire cable, about ⅜ of an inch in diameter, is more easily obtained in continuous lengths and meets practically every requirement. Iron, however, answers very well, being preferred by some authorities, and can be used in the shape of rod or tape. The lightning conductor should be of the same material and continuous throughout, joints being either avoided or constructed most carefully. In its course to the earth care should be taken not to have sharp bends, corners, or curves. An important consideration is the connection with the ground, and while it is possible to connect directly with water pipes, an independent ground is far better; running water, a deep well or boring, can be utilized with great advantage as a terminal for the conductor. A ton of charcoal or coke buried in the ground and a trench filled with the same material and leading to water also make a good ground.

In the United States there are few lightning flashes so intense that a good lightning rod, well earthed, will not provide an easy path for the lightning; and while such protection is not necessary for houses in the city built in close blocks with metallic roofs and cornices, yet for barns and dwellings in the country authorities unite in pronouncing good lightning conductors eminently desirable.

The Washington Monument at Washington, D. C., has furnished one of the best instances of the effectiveness of lightning conductors as a protective device. As it stands 555 feet in height in the centre of flat and well-watered ground, it should be a conspicuous mark for lightning. It is protected by means of a system of four heavy copper rods secured firmly along the edges of the pyramidal summit and joined together by numerous horizontal rods sunk into the horizontal seams of the marble masonry. At the extreme apex of the monument the four inclined main copper rods join the massive aluminium cap of the pyramid. The cap and the whole system of external copper rods are put into perfect electrical connection with the steel work constituting the stairway and elevator system of the monument. At intervals of about 5 feet the external system of copper rods is studded with copper points, numbering in all about 200. In the 30 years elapsing since this improved arrangement was introduced, the monument has not been injured in any way by lightning. Previously, when the aluminium cap alone constituted the receiving system for the thunderbolt, there was one lightning stroke which, while causing slight damage to the pyramid, nevertheless demonstrated the necessity for the better protection described above. Sir Oliver Lodge, the celebrated English authority on the subject of lightning conductors, who has within a few years advanced some novel ideas on this matter which have tended to change previous theories, says "Almost any conductor is probably better than none, but few or no conductors are absolute and complete safeguards." For further information, consult: Sir Oliver Lodge, *Lightning Conductors and Lightning Guards* (London, 1892); A. J. Henry, "Lightning and Lightning Conductors," in *Farmers' Bulletin No. 367* (Washington, 1909); L. J. Smith, "Protection of Farm Buildings from Lightning," in *Manitoba Agricultural College, Bulletin No. 4* (Winnipeg, 1911); E. W. Kellogg, "Use of Metal Conductors to Protect Buildings from Lightning," in *University of Missouri, Engineering Experiment Station, Bulletin*, vol. iii (Columbia, 1912); and United States Weather Bureau bulletins on lightning.

LIGHTNING ARRESTERS. Devices to protect electrical apparatus from damage by lightning. In the early days of telegraphy and telephony many accidents were caused by lightning striking the wires and running into the offices, often injuring the operator and destroying property. In order to obviate these difficulties an instrument was devised and called a lightning arrester. The original simple form is shown in Fig. 1. The three plates *A*, *B*, *C*, are mounted upon an insulating block. For example, the plate *A* is connected to the ground, *B* to one side of the telegraph or telephone in-

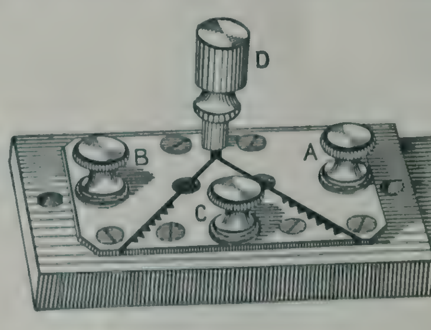


Fig. 1.

strument, and *C* to the line wire and to the other side of the instrument. In ordinary operation the currents from the line cannot go from *C* across to *A* without going through the instrument, but if the line is struck by lightning the latter comes to *C*, and by reason of its high pressure jumps from the jagged edges of *C* over to *A* and *B*, without going through the other instruments at all, on account of their high impedance (effective resistance). The arrester provides a crosscut, or short circuit, so that the lightning reaches the earth without going through the telegraph or telephone apparatus.

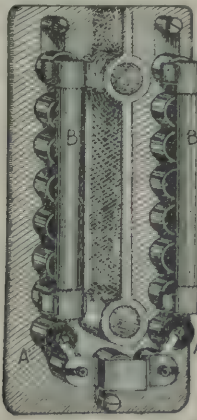


Fig. 2. LIGHTNING ARRESTERS.

Fig. 2 shows a simple form of arrester for electric-power circuits. *AA* are metallic cylinders separated from each other by air gaps about $\frac{1}{32}$ of an inch across; connected to the outer cylinders are high-resistance carbon sticks *BB*. As many of these units as are desired, depending upon the line pressure, can be connected in series between each wire of the transmission line and the ground. Lightning, striking the line, jumps across the gaps between the cylinders; any tendency to form a continuous arc is checked by the cooling effect of the mass of metal in the cylinders and the high resistance offered by the carbon sticks. Fig. 3 shows a simple arrester of a different type, used to protect a generator.

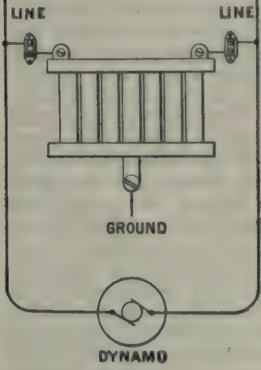


Fig. 3.

For the protection of transmission circuits carrying large quantities of energy at high voltage, special forms of lightning arresters are required. For this purpose two general types are in use, the horn-gap and the aluminium-cell arrester. The former is made of two metal rods curved somewhat in the shape of the horns of an animal and mounted on regular porcelain insulators. One of these is connected to the line to be protected from the lightning discharge, the other to the earth. At the lower extremity these horns are separated by a distance varying from about $\frac{1}{16}$ of an inch to as much as 10 inches, depending upon the operating voltage of the line, the latter distance being used at 110,000 volts. When a lightning discharge occurs, the current jumps to earth across the narrow space between the horns; but the tendency to form a destructive arc by the energy on the line is neutralized by the strong convection current in the air due to the development of heat at the gap and by the magnetic effect of the current, which together cause the discharge to rise rapidly from the point of its origin until the increasing space between the horns ruptures the arc.

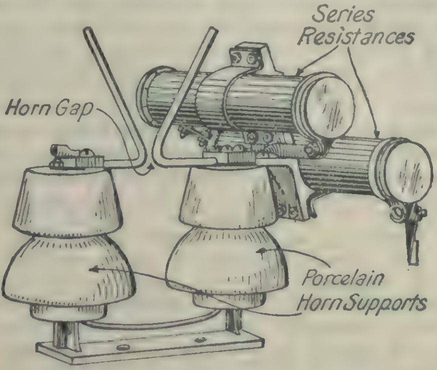


Fig. 4. HORN-GAP LIGHTNING ARRESTER.

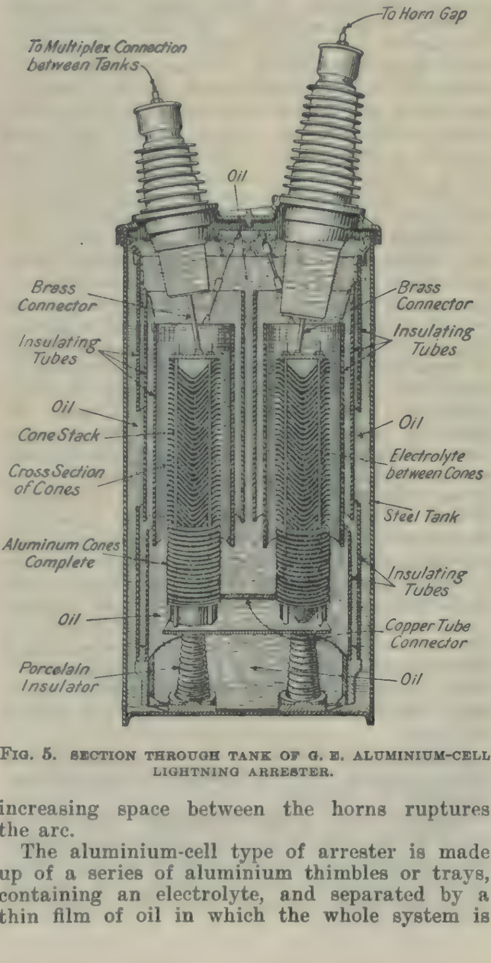


Fig. 5. SECTION THROUGH TANK OF G. E. ALUMINIUM-CELL LIGHTNING ARRESTER.

The aluminium-cell type of arrester is made up of a series of aluminium thimbles or trays, containing an electrolyte, and separated by a thin film of oil in which the whole system is immersed. One end of this system is grounded and the other connected to a modification of a horn-gap arrester, which in turn is connected to the line. A lightning discharge received by the line dissipates its energy in electrolytic action and by many small arcs across the air gaps between the trays. While no device has been so far put in use successfully to resist every lightning stroke, it is generally agreed by electrical engineers that the aluminium-cell type affords the maximum protection for high-voltage power circuits.

Bibliography. The most fertile field for information on modern practice is the files of the *Transactions of the American Institute of Electrical Engineers* (New York), and especially papers by R. D. Mershon, in vol. xxii (1903); N. J. Neal, in vol. xxiv (1904); H. C. Wirt, in vol. xxv (1906); N. Rowe, in vol. xxxvi (1907); E. E. Creighton, in vols. xxvi, xxvii, xxxiii (1907, 1908, 1914); R. P. Jackson, in vol. xxvi (1907); Steinmetz, in vol. xxvi (1907); Creighton and Shavor, in vol. xxxi (1912); papers in the *General Electric Review* (Schenectady, June, 1908, February, 1910).

LIGHTNING BUG. See Firefly.

LIGHTNING CONDUCTOR. See Lightning, Protection from.

LIGHTNING INJURIES. Individuals struck by lightning are not always instantly killed. When the stroke is fatal, the muscles become rigid, and the body of the victim either falls to the ground or, when supported, remains fixed in a rigid attitude. In such a case there may not be any visible sign of injury, but the heart may be ruptured or the internal organs damaged. On the other hand, the body may be mutilated, the bones shattered and stripped of their fleshy covering. Rigor mortis supervenes rapidly in fatal cases. Lightning is apt to follow a most fantastic course; the victim may be stripped of his clothing and remain uninjured, and metal substances may fuse and give rise to superficial burns. Nonfatal injuries are generally followed by sudden collapse, with unconsciousness. Recovery may be interrupted by drowsiness, fever, delirium, convulsions, and severe prostration. Other cases exhibit paralysis of one or more limbs, impairment of vision, or blindness, severe neuralgia, and other symptoms due to nervous shock. Many of these symptoms are recovered from only after the lapse of long periods of time. The slighter forms of lightning stroke may give rise to small subcutaneous hemorrhages, discolorations, and burns, varying in extent and degree. The growth of hair is sometimes arrested. A few cases have been reported in which the action of the current has been photographic, leaving pictures of neighboring objects upon the skin. Lightning burns heal very slowly. The treatment of nonfatal cases consists in the application of warmth to the surface of the body, artificial respiration, and the administration of stimulants hypodermically, or by mouth when this is possible. Lightning injuries are fatal in about 25 per cent of the cases.

LIGHT OF ASIA, The. A poem by Sir Edwin Arnold (1878), treating of the life and teachings of Buddha.

LIGHT OF THE WORLD, The. 1. A poem by Sir Edwin Arnold (1891), treating of the life of Christ. 2. An oratorio by Sir Arthur Sullivan (1873). 3. A painting by Holman Hunt at Keble College, Oxford, showing the Saviour standing with a lantern before a tightly closed door.

LIGHTS, Ship's. Lanterns used on board ship. There are the *running lights* which are required by the Rules of the Road (q.v.), and which consist of *masthead lights* and *side lights.* In addition to these there are *signal lights* used in making signals (q.v.); *standing lights,* which are permanent lights on the lower decks or in the superstructure for lighting passageways and large compartments. In men-of-war it was formerly the custom to extinguish lights in the wardroom at 10 P.M., and the junior officers' quarters at 9, except when an extension of time was granted by the commanding officer. Since the introduction of electric incandescent lamps for lighting men-of-war and the separation of the wardroom and junior officers' messrooms from the staterooms, the rules have become less rigid. In passenger steamers lights are extinguished in certain saloons and other places at 11 or 12 o'clock.

LIGHTS, Use of, in Public Worship. A practice which prevailed in the Jewish (see Ex. xxv. 31–39) and some other ancient religions and was retained in the Christian Church —not merely for the obvious purpose of illumination, but as a token of joy and with a symbolic allusion to Christ as the "Light of the World." This particular symbolism finds its closest application in the paschal candle which is solemnly blessed on Holy Saturday. (See Easter.) There is some evidence pointing towards a repudiation by the early Church of lights in worship; but it is clear that by the fifth century the use of candles and lamps was an ordinary accompaniment of Christian worship and of the administration of the sacrament of baptism. It has been maintained uninterruptedly by the Roman Catholic and Eastern churches; at the Reformation it was abandoned by most Protestant bodies, though the Lutherans of Germany have very generally retained it, and there are a few instances of its survival in England before the practice again became general in the ritualistic movement of the nineteenth century. In numerous English instances the altar candles remained, but were not burned. In the Roman Catholic church their usage is strictly regulated; priests are forbidden to say mass without at least two lighted tapers; the material is limited to wax, which is used unbleached on Good Friday and in masses for the dead. Candles are solemnly blessed for public and private use on the Feast of the Purification, known by the English usage as Candlemas (q.v.). A small candle called *bugia* is placed upon the altar when a bishop celebrates mass; and in the case of the Pope seven candles are carried before him or held on each side of him in allusion to the seven golden candlesticks of Rev. i. 12. Pure olive oil is required for lamps. The red lamp burning before an altar usually, though not invariably, denotes the presence of the reserved Sacrament. Consult: Andreas Schmid, *Der christliche Altar und sein Schmuck* (Regensburg, 1871); Wolfgang Mühlbauer, *Geschichte und Bedeutung der Wachslichter bei den Kirchlichen Functionen* (Augsburg, 1874); Vernon Staley, *Studies in Ceremonial* (London, 1901).

LIGHTSHIP. See Lighthouse.

LIGHT THERAPY, LIGHT TREATMENT. See Finsen, N. R.; Heliotherapy; Phototherapy.

LIGN ALOES, līn ăl′ōz. See Aloes Wood.

LIGNE, lē̆′ny’, Charles Joseph, Prince de (1735–1814). An Austrian soldier, diplomat, and author. He was born in Brussels and was descended from a wealthy and powerful Belgian family. In 1752 he entered the Austrian army, in which he served with distinction through the Seven Years’ War. During the reign of Joseph II he held high military and diplomatic positions, visiting every court on the Continent, and was particularly a favorite at the court of St. Petersburg. He was made a field marshal by Catherine II of Russia. He commanded the Austrian artillery at the siege of Belgrade in 1789. When the French conquered Belgium, he lost all his estates. He was one of the well-known figures of his time and corresponded with Rousseau, Voltaire, Frederick the Great, Wieland, Schlegel, and Goethe. Of his miscellaneous works in 34 volumes, which appeared in 1790–1811, Malte-Brun has given selections in two volumes (*Œuvres choisies*, 1809). His memoirs and letters have considerable historic value.

LIG′NIFICA′TION (from Lat. *lignum*, wood + *facere*, to make). A process in plants by which the more or less thickened cell wall becomes impregnated with lignin, a substance which makes the wall harder and more elastic. A lignified wall is permeable to moisture, but cannot absorb or retain much. Lignification occurs in the vessels and fibrous tissue, less often in parenchyma, and reaches its highest expression in the seed plants, where the lignified tissues constitute the wood. This tissue is also highly developed in the ferns and their allies, but in the mosses it is scanty or lacking altogether.

LIG′NIN. See Lignification.

LIG′NITE (from Lat. *lignum*, wood). A member of the coal series, which, although a mineral substance, is of vegetable origin and often shows a distinct fibrous or woody structure, clearly visible to the naked eye. The external form is sometimes well preserved, and lignitized tree trunks and pieces of lignitized wood are not uncommon in many clay and sand formations of recent geological age. Lignite has usually a dull lustre, conchoidal fracture, and brown streak. It may be brown or black in color and is often of open texture. It burns readily with a smoky flame and is inferior to the bituminous and higher grades of coal in its heating power. It grades into subbituminous coal, from which it is sometimes difficult to distinguish it. The latter, however, is usually black, has more lustre, and on account of its average lower moisture content does not disintegrate as readily. Lignite, on account of the high percentage of moisture which it contains, disintegrates rapidly on exposure to the air, and hence it cannot be stored for a long period or transported to a great distance without danger of its crumbling to powder. Lignite occurs in beds, its mode of occurrence being similar to that of the higher grades of coal; but the associated beds of rock are usually of a more or less unconsolidated nature and moreover show practically no disturbance. It is not found in formations older than the Mesozoic, and is especially abundant in those of Cretaceous and Tertiary age.

The following table gives the composition of some American lignites:

	PROXIMATE ANALYSIS				ULTIMATE ANALYSIS					CALORIFIC VALUE	
	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units
1	18.12	42.77	23.61	15.50	0.43	5.51	44.77	0.88	32.91	4,386	7,895
2	39.43	26.49	24.37	9.71	0.49	6.98	36.33	0.68	45.81	3,531	6,356
3	34.55	35.34	22.91	7.20	1.10	6.60	42.40	0.57	42.31	3,939	7,090
4	35.96	31.92	24.37	7.75	1.15	6.54	41.43	1.21	41.92	3,927	7,069
5	31.06	27.67	33.39	7.88	0.99	6.53	44.70	0.90	39.00	4,372	7,840
6	....	40.14	48.43	11.43	1.43	4.46	64.84	1.31	16.53	6,342	11,416

1, Cook Inlet, Alaska; 2, Ouachita Co., Ark.; 3, Dawson Co., Mont.; 4, McLean Co., N. Dak.; 5, Olsen, Tex.; 6, same as 5, moisture free.

Lignite may be used for fuel in the lump form as mined, provided it is consumed near the point of production. If this is not done, it is desirable, if not important, to use it in briquettes or in a gas producer. For the former it is pulverized and pressed into blocks or cakes, the lignite being either used alone or mixed with some form of binder, such as pitch. The quantity and kind of binder used is not the same in all cases. When the great lignite fields of the northwest are extensively developed, both of these methods of use will become important. Much of the material formerly called lignite is now classed as subbituminous coal.

Jet is a variety of lignite, of coal-black color, and so dense that it can be easily carved into small ornaments. Phillips states that it is a coniferous wood and was first found at Whitby and other localities in England, having been known since early British times. *Brown coal* is another name for lignite, which is chiefly used in Europe. *Bovey coal* is a local name used in Devonshire, where extensive beds occur. In the United States deposits of lignite are found chiefly in the Tertiary. Those worked occur in Arkansas, Texas, North Dakota, South Dakota, and Montana; but most of these are at the present time of comparatively little value, as there are better grades of coal available. A small area of no importance is situated in the Gulf States.

In western Canada much lignite is found in the Belly River series of the Cretaceous, underlying a large area in Alberta, while other deposits of Tertiary age are known in the Souris field of southern Saskatchewan.

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LIG′NUM RHO′DIUM (Lat., Rhodian wood). The rose-scented wood of both root and stem of *Convolvulus scoparius* and *Convolvulus floridus*, exported from the Canary Islands. These are shrubs or small trees with linear leaves and bell-shaped flowers. The wood is usually marketed in strong, thick, and rather heavy cylindrical but knotty pieces covered with a cracked gray bark. Internally it is yellowish, and often reddish in the heart. It has an aromatic bitterish taste and when rubbed emits an agreeable roselike odor. Its strong-smelling essential oil (oil of lignum rhodium), obtained by distillation, is used for ointments, etc., and also very frequently to adulterate attar of roses. A similar article of commerce is obtained from *Amyris balsamifera*, a native of Jamaica, which yields an essential oil, closely resembling the former. The lignum rhodium of the Levant (*Liquidambar orientale*) is now rarely seen in commerce. From it, however, the name has been transferred to the other kinds.

LIG′NUM-VI′TÆ. A tropical tree. See Guaiacum.

LIGNY, lē′nyē′. A village in the Province of Namur, Belgium, 9 miles northeast of Charleroi, the scene of a battle between the French under Napoleon and a Prussian army under Blücher (Map: Belgium, C 4). After driving the Prussian vanguard from Charleroi on June 15, 1815, Napoleon dispatched Ney with 50,000 men to engage Wellington at Quatre-Bras, while the French right, numbering some 60,000, led by the Emperor and Grouchy, prepared to assail the Prussian army, which was drawn up more than 80,000 strong between the villages of Saint-Amand and Sombref, with its centre at Ligny. At three o'clock in the afternoon of the 16th the sound of heavy cannonading announced that fighting was going on at Quatre-Bras, 7 miles away. The Emperor immediately ordered an attack, and the Prussians at the first onset were driven from Ligny. They returned, however, in increased numbers and succeeded in recapturing the village, but only to lose it again. The battle was decided by a charge of the Guard and Cuirassiers through the centre of the Prussian army, which broke and fled in spite of Blücher's desperate endeavors to rally his troops. An unaccountable omission on the part of Napoleon to hurl Erlon's fresh corps on the rear of the discomfited Prussians saved the enemy from destruction. After the first moments of panic the retreat was admirably conducted by Gneisenau (q.v.), Blücher's chief of staff, who by falling back on Wavre made possible the subsequent opportune arrival of the Prussians on the field of Waterloo (q.v.). The Prussians lost about 12,000 men in dead and wounded, while the loss on the side of the French was 8000. Consult W. O'C. Morris, *The Campaign of 1815: Ligny, Quatre-Bras, Waterloo* (London, 1900).

LIGONIER, lĭg′ô-nēr′, John (or Jean Louis), Earl (1680–1770). A British soldier, born at Castres, France. He volunteered in Marlborough's army in 1702, purchased a captain's commission in the next year, and, beginning with the storming of Liége, he participated with distinction in nearly every important operation in the Low Countries until 1710. In 1712 he was appointed Governor of Fort St. Philip, Minorca, was adjutant general in 1718 of the expedition to Vigo, and in 1720–49 was colonel of the famous "Black Horse" regiment. Promoted to major general in 1739, he participated in the Rhine campaign of 1742–43, winning another promotion to lieutenant general in the latter year. In 1746, as commander of the British troops in the allied army in Austrian Netherlands, he participated in the battle of Roucoux, and in the next year as general of horse under the Duke of Cumberland he led a brilliant charge at the battle of Val. Although Ligonier defeated the designs of the enemy in this engagement, he was taken prisoner. After the Peace of Aix-la-Chapelle he returned to England, where he was elected to Parliament in 1748, was made commander in chief and Viscount in 1757, Baron in 1763, and Earl and field marshal in 1766.

LIGORIO, lē-gô′rĭ-ō, Pirro (1530–80). A Neapolitan architect and archæologist. He was employed by Paul IV (Pope, 1555–59), probably worked under Michelangelo, and constructed the Villa Pia at Rome. He built the Palazzo Lancellotti at Rome, and in 1564 he became associated with Vignola as engineer of St. Peter's Church. In 1568 he was engaged by Alfonso II d' Este at Ferrara, where he spent the remainder of his life. Thirty manuscript volumes of his *Le Antichità di Roma*, containing valuable drawings of ancient monuments, are to be found in the library at Turin, and others are in the Bibliothèque Nationale, Paris, at Naples, at the Vatican, at Windsor, and elsewhere.

LIGUESTE, lē′gĕst′, Pierre Laclède (1724–78). An American trader and the founder of St. Louis, Mo. He was born in France, emigrated to New Orleans later, obtained from the authorities there the exclusive right to trade in furs with the Indians on the Missouri, organized the Louisiana Fur Company, and in 1764 founded St. Louis (q.v.), where he continued to live until his death. His name is frequently written as Pierre Ligueste Laclède, but this is an incorrect order.

LIG′ULE (Lat. *ligula, lingula*, dim. of *lingua*, OLat. *dingua*, tongue; ultimately connected with Eng. *tongue*). In general, an outgrowth from the surface of a leaf or leaflike organ. In practice the name is applied in three groups of plants, the most conspicuous of which is the grass family. The leaves of grasses have two distinct regions, the spreading portion (blade) and that which envelops the stem (sheath). At the juncture of blade and sheath the ligule appears as a more or less conspicuous flaplike outgrowth. The two other groups are the little club mosses (*Selaginella*) and the quillworts (*Isoetes*), both of which belong to one of the great groups (Lycopodiales, q.v.) of the fern plants (Pteridophytes). In both of these cases there is an outgrowth from the surface of the leaf, which is particularly prominent in the very young stages of the leaf and may be regarded as an embryonic structure. In other cases of such outgrowths the term "ligule" is not applied, but the structure is essentially the same. For example, in some flowers of the pink family there is a two-toothed outgrowth from the surface of each petal, the five outgrowths encircling the throat of the flower and resembling a small 10-toothed crown, called in consequence a corona. A similar corona is conspicuous in the various species of *Narcissus*, as jonquils, daffodils, etc., often forming a striking feature of the flowers. The significance of ligular outgrowths in the plant economy is quite obscure. In the case of foliage leaves, as grasses, little club mosses, and quillworts, they seem to be structures that are of service only in the embryonic stages of the leaf, disappearing entirely or remaining only as rudiments when the blade is mature. In flowers, as in pinks and species of *Narcissus*, they add to the floral display and are doubtless of service in connection with insect pollination.

LIGUORI, lé-gwō′ré, ALFONSO MARIA DI, SAINT (1696–1787). A Roman Catholic ecclesiastic and theologian, founder of the Redemptorist (q.v.) Order. He was born of a noble family at Marianella, near Naples, and at first studied law, taking his doctor's degree at the age of 16 and beginning to practice at 20. Six years later he abandoned the profession for the purpose of devoting himself to a religious life. He was ordained priest in 1726 and undertook with great zeal the duties of his new calling. Under the influence of Thomas Falcoja, Bishop of Castellamare, he decided to found a new congregation for missionary effort; and in 1732, at Scala, near Amalfi, he organized the Congregation of the Most Holy Redeemer, which Pope Benedict XIV approved in 1749, appointing the founder general for life. In 1762 he was appointed Bishop of Sant' Agata de' Goti in the Kingdom of Naples. After instituting many reforms and suffering from a disabling illness, he resigned his see in 1775, after which he returned to his order and continued to live in simple austerity until his death, at Nocera de' Pagani, in 1787. He was beatified in 1816, canonized in 1839, and solemnly declared a doctor of the Church in 1871. The special importance of his teaching is in the department of moral theology. Under the name of Probabiliorism, a modification of the earlier so-called Probabilism, it has been very widely followed in the direction of consciences in the Roman Catholic church. His most important work is his *Theologia Moralis* (1753), which grew out of an edition of Busembaum's earlier treatise published by him in 1748 (Eng. trans., abridged, 7th ed., 2 vols., New York, 1890). The best edition is by Gaudé (Rome, 1905). His complete works have been frequently published, recently at Turin (1877 et seq.). Part of a projected English version has been published (London, 1854–68). A complete translation into Latin was made by P. Walter (New York, 1903).

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LIGUORIANS, lĭ-gwō′rĭ-*a*nz. See REDEMPTORISTS.

LIGURES, lĭg′ů-rēz. See LIGURIA; LIGURIAN.

LIGURES BÆBIANI. See LIGURIA.

LIGU′RIA. In ancient geography, a region in north Italy (Map: Italy, B 2). As defined in the time of Augustus, it embraced the territory from the Ligurian Sea (Gulf of Genoa), across the Maritime Alps, to the Po in the north, and from the Varus in the west to the Macra in the east. At a very early period the Ligures possessed a larger territory, extending far into Gaul, on the west side of the Rhone, and perhaps even into Spain; in Italy their land spread once as far south as Pisa and Arretium. The Ligurians (Lat. *Ligures*) were fine soldiers and sailors. They were subjugated by the Romans in the second century B.C. In 180 B.C. the consuls Bæbius and Cornelius transferred 47,000 Ligurians from the territory about Luna to two places in Samnium; these settlements were known as Ligures Bæbiani and Ligures Corneliani. The site of the former has been found, 15 miles north of Beneventura. There a large bronze tablet was found, giving important information concerning a foundation of Trajan (q.v.), whose purpose was the support of poor children. Augustus made Liguria, a district more extensive than modern Liguria, the ninth region of Italy. Genua (now Genoa) was the most important town of the district. (See also POLLENTIA.) Modern Liguria includes two provinces, Genoa and Porto Maurizio; these belonged for a time to the Republic of Genoa (q.v.). Ancient Liguria produced timber, sheep, mules, ponies, and cattle; modern Liguria produces maize, wheat, lemons, oranges, wine, fruits, and potatoes. The coast district of Liguria is known now as the Riviera (q.v.). (See LIGURIAN.) Consult the article "Ligurer," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

LIGU′RIAN. The name now applied to the tall, dark, long-headed people about the Gulf of Genoa, Italy, and southward. Formerly the term was given under a misapprehension to the broad-headed type of middle Europe. It is now believed by some scholars that the entire Italian peninsula was peopled by a primitive long-headed Ligurian type, underlying the modern one. The purest representatives of the ancient Ligurians are the tall, dark, and exceedingly dolichocephalic population of the district about Lucca. It is claimed that they preceded the Romans in Italy. The evidence of their inscriptions, particularly of the place names found in those inscriptions, would seem to show that the Ligurians were Indo-Europeans.

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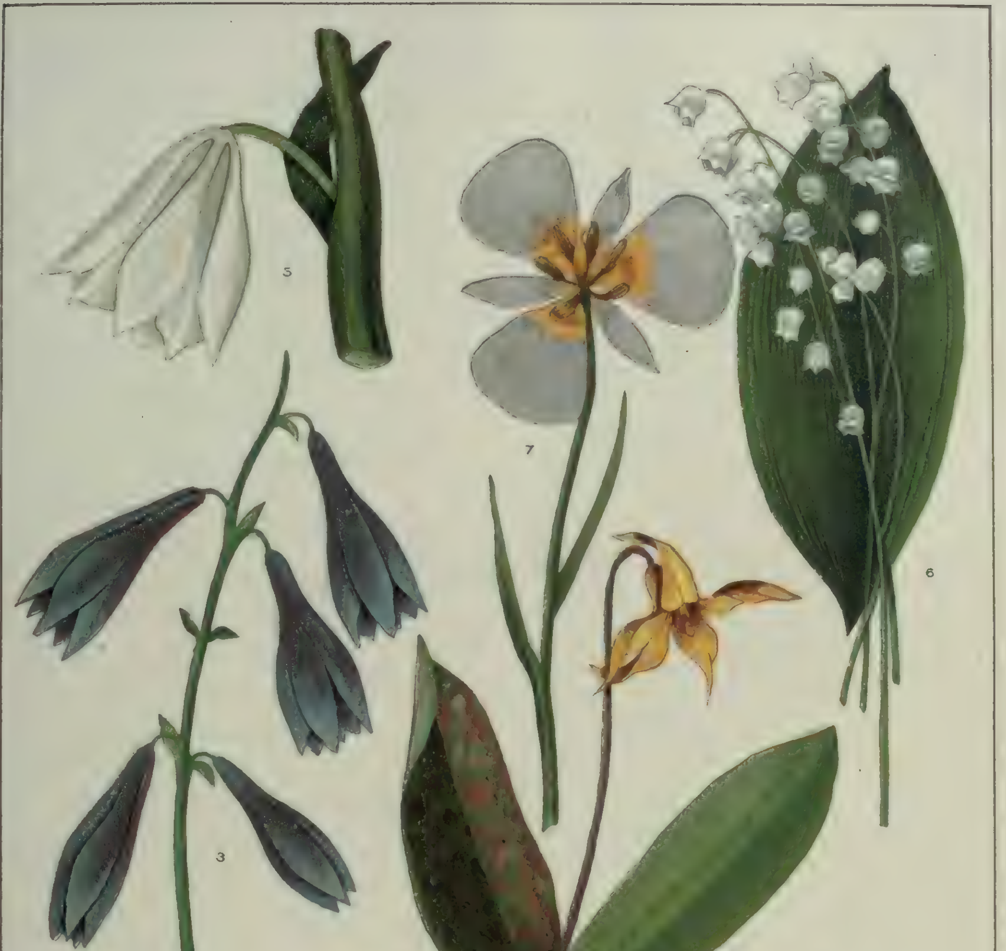
LIGURIAN REPUBLIC. The name given to the Republic of Genoa in 1797, when it was obliged by Napoleon Bonaparte to exchange its aristocratic for a democratic constitution. It was ruled by a directory till 1802, when a doge was made the chief executive. In 1805 the Republic was incorporated in the French Empire. See GENOA.

LIGURIAN SAGE. A name given to the poet Aulus Persius Flaccus.

LI HUNG CHANG, lē hụng chäng (1823–1901). A Chinese statesman, born in Luchow, Ngan-hwei Province, Feb. 16, 1823. He was well educated and passed through the various grades of scholarship, receiving the highest degree (Tsin-shi) in 1847. In 1849 he entered the Hanlin College. As early as 1853 he distinguished himself in the field against the Taipings at the head of militia he himself raised. Passing through several minor offices, he became in 1864 Governor of the Kiang Provinces, in which capacity he was intrusted with the task of putting down the Taiping rebels who had continued to hold their own. With the assistance of the "Ever-Victorious Army" under Charles George Gordon (q.v.) Li Hung Chang was successful in suppressing the rebellion. When Nanking was captured, Gordon promised that the lives of the rebel leaders should be spared; but they were all killed by Li's orders—a treacherous act, which so angered Gordon that he resigned his command. Li now became successively commander of the Chinese Imperial forces, an earl, head of the naval administration, and Viceroy of the capital Province of Chi-li. This last appointment placed him practically next the throne, and he held it for the exceptional period of 24 years, from 1870 to 1895. During the entire period the foreign policy of China was under his control. Without becoming a partisan of the Western civilization, he recognized the necessity of reorganizing the fighting forces of China on a modern basis, in order to meet the threatening encroachments of the European Powers and the rising influence of Japan, whose interests in Korea were coming into conflict with those of the Chinese. Under Li's supervision the army and the navy were greatly strengthened. The war with Japan found him in a position of great responsibility. He had been instrumental in bringing on the war, and he had to bear the brunt of the defeat which followed, although the inefficiency of the Chinese forces was largely due to the way in which his plans for military and naval improvement had been hampered by Chinese court methods. It was equally a part of these methods that he should be made a scapegoat by the Emperor, and accordingly before the close of the war he was removed from office, deprived of the insignia of his rank, and sent into retirement. He was, however, recalled and invested with full powers to negotiate a peace with Japan after the fall of Wei-hai-wei. He was received in that country with respect and obtained terms which, hard as they were, were probably better than could have been obtained by any other person under the circumstances. In 1896 he represented China at the coronation of Emperor Nicholas II of Russia and then made a tour of the world, passing through Germany, France, England, and the United States, and was received everywhere with high honors. Upon his return to China he became the virtual head of the Tsung-li Yamen, or Foreign Office. He returned to the governership of the Kiang Provinces in 1900, but was soon recalled to the governorship of Chi-li and his former extensive powers, because he was the only man who could be relied upon to meet the emergency in the foreign relations of the Empire produced by the Boxer outbreak. His last public task was the settlement with the European Powers and the United States of the issues raised by that trouble. He died Nov. 7, 1901. Li Hung Chang was able, crafty, and, according to European morals as well as the best teachings of the Chinese moral code, unscrupulous. He accumulated a colossal fortune in the public service. He was not a friend to the foreigner, but he believed in the value of the material civilization of the West and wished China to profit by its lesson and strengthen herself thereby. It was commonly believed that Li was not incorruptible, and it was asserted that he had accepted retainers from Russia. He certainly sought to maintain a good understanding with that Empire, though this may well have been only what he regarded as a necessary policy under the circumstances. In internal policies he was generally identified with the party of the Dowager Empress, though he was too shrewd to go all lengths with her radical advisers. Li Hung Chang could not, however, have been the statesman he unquestionably was if he had not preserved a certain rugged integrity of purpose. While he sought his own advantage, he served his country sincerely and was one of her few statesmen of commanding ability. He was a man of powerful physique and great capacity for work. Consult: R. K. Douglas, *Li Hung Chang* (London, 1895); R. E. Lewis, "The Machiavelli of Chinese Diplomacy," in the *Forum*, vol. xxxi (New York, 1901); D. C. Boulger, "Li Hung Chang: Statesman or Impostor," in *Fortnightly Review*, vol. lxxvi (London, 1901); W. F. Mannix (ed.), *Memoirs of Li Hung-Chang* (Boston, 1913). See CHINA.

LI′LAC (Sp. *lilac*, from Ar. *līlāk*, lilac, from Pers. *lilaj, lilanj, lilang*, indigo plant, from *nīlah*, indigo plant, Skt. *nīla*, dark blue), *Syringa.* A genus of shrubs and small trees of the family Oleaceæ. The common lilac (*Syringa vulgaris*), a native of the north of Persia, is one of the most common ornamental shrubs cultivated in Europe and North America. It was first brought to Vienna during the latter part of the sixteenth century by Busbecq, the Ambassador of Ferdinand I, who also introduced the tulip into European gardens. There are many fine single and double flowered varieties. The blossoms, which appear in May in large terminal clusters, are bluish, purple, or white, and very fragrant. The plant grows from 6 to 15 feet high and is well adapted for grouping in landscape gardening. The wood is fine-grained and is used for inlaying, turning, and making small articles. The lilac succeeds almost anywhere, but does best upon a rich deep loam. It is usually propa-

LILIACEAE



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1 AMERICAN TURK'S-CAP LILY - LILIUM SUPERBUM
2 DUC VAN THOL TULIP - TULIPA SUAVEOLENS
3 BLUE DAY LILY - FUNKIA OVATA
4 YELLOW DOG'S-TOOTH VIOLET OR ADDER'S-TONGUE - ERYTHRONIUM AMERICANUM
5 SPANISH BAYONET - YUCCA BACCATA
6 LILY-OF-THE-VALLEY - CONVALLARIA MAJALIS
7 MARIPOSA OR BUTTERFLY-LILY - CALOCHORTUS GUNNISONI

gated by means of suckers, which often appear too freely, or by cuttings of mature or green wood. Choice varieties, of which there are many, are often grafted on privet and common lilac stocks. Flowers may be obtained throughout the year by artificial greenhouse methods. See Plate of California Shrubs.

LIL'BURNE, John (1614–57). An English agitator and pamphleteer. He was born at Greenwich and was educated at Newcastle and Auckland. He was apprenticed to the wholesale cloth trade, but, imbibing opinions in opposition to the English church, at the age of 18 he went to Holland to procure the printing of a pamphlet against the bishops. This he sought to circulate secretly, but was exposed to the authorities, tried in the court of the Star Chamber, condemned in February, 1637, to receive 500 lashes, to be pilloried and confined in prison, fined £500, and required to give security for good behavior. His courage before the judge and during his punishment gained him the sobriquet of Freeborn John. Given his liberty in 1640, he placed himself at the head of the "levelers" (q.v.) and demanded that Lord Stratford should be arraigned. He was again arrested and taken before the House of Lords; but such was the pressure of public opinion in his favor that Parliament released him and subsequently declared his punishment to have been illegal, barbarous, and tyrannical, and recompensed him for his imprisonment and injuries by the payment of £3000. He joined the army of the Parliament against Charles I, became lieutenant colonel, was taken prisoner at Brentford, and would have been hanged had not the Parliament's general, the Duke of Essex, threatened to hang Royalist prisoners in retaliation. He soon became dissatisfied with the Presbyterian leaders and published charges and denunciations even against Cromwell. The latter procured his trial before a commission, by whom he was acquitted. Emboldened by this, he began a violent agitation against Cromwell, read in public a pamphlet entitled *England's New Chains*, and in consequence was committed to the Tower. Thence he poured out political pamphlets which gave him great popularity with the people. He was again brought to trial, but the pressure of popular opinion in his favor determined his acquittal. But Cromwell soon after secured his condemnation and banishment for a vicious attack on Haselrig. During his exile he resided in Brussels and Amsterdam and intrigued with Royalist exiles for the restoration of the monarchy. After the dissolution of the Long Parliament he returned to England without permission and was immediately arrested and tried. Although acquitted of any crime meriting death, his freedom was denied him for "the peace of the nation" until 1656, when, having espoused the doctrines of the Friends, or Quakers, he was released. He died at Eltham. The title of his earliest biography is *The Self-Afflicter Described* (London, 1657). Consult S. R. Gardiner, *History of the Great Civil War* (London, 1901), and, for a complete bibliography of his pamphlets, *Notes and Queries* (ib., 1888).

LIL'IA'CEÆ (Neo-Lat. nom. pl., from Lat. *lilium*, from Gk. λείριον, *leirion*, lily; connected with λειρός, *leiros*, pale), The Lily Family. A large family of the monocotyledons, including approximately 2500 species, or about one-eighth of the monocotyledons. This family may be regarded as representing the typical monocotyledons. Its members can be recognized as having hypogynous and showy flowers, with three sepals, three petals, six stamens, and three carpels, which are syncarpous, ripening to form a capsule, but in some groups forming a berry. The range of variation in the family may be indicated by the fact that at least 13 tribes are represented, but they are distinguished from one another by various simple combinations of characters. Many of the so-called lilies of cultivation are not members of this family, but belong either with the *Iris* or *Amaryllis*. These false lilies may be recognized at once by the fact that their flowers are epigynous. Among the useful plants of the family are *Asparagus* and *Allium* (onion, leek, garlic, etc.). Among the well-known garden flowers are *Convallaria* (lily of the valley), *Lilium* (lilies of various kinds), *Tulipa* (tulip), *Hyacinthus* (hyacinth), and *Hemerocallis* (day lily). The conspicuous North American genera are as follows: *Veratrum* (hellebore), *Uvularia* (bellwort), *Allium* (onion), *Lilium* (lily), *Erythronium* (dog's-tooth violet), *Yucca* (Spanish bayonet), *Smilacina* (false Solomon's seal), *Polygonatum* (Solomon's seal), *Trillium* (wake-robin), and *Smilax* (greenbrier).

LILIBEO, lē'lê-bā'ō. See Cape Boeo.

LILIENCRON, lē'lĭ-*e*n-krōn, Detlev (Friedrich), Baron von (1844–1909). A German poet and novelist, one of the best modern lyrists and a leader in revolutionary literary circles. He was born in Kiel, entered the Prussian army, served in the campaigns of 1866 and of 1870–71, and was severely wounded in each. He left the army on account of debts. After trying to recoup his fortune in America—his mother was born in Philadelphia—he was in the employ of the German government until 1887, when he devoted himself entirely to literature. He married three times. One of the oldest of the "Young German" authors, Liliencron was also one of the most influential; he was a member of the Berlin Freie litterarische Gesellschaft and one of the founders of the Munich Gesellschaft für modernes Leben. Nearly all of the members of the new school in Germany became attached to him by personal or literary ties. His lyrics are better than his novels, among which mention should be made of the popular *Breide Hummelsbüttel* (1886; 2d ed., 1900), *Der Mäcen* (1890; 3d ed., 1900), and the *Kriegsnovellen* (1896; 4th ed., 1902); and much better than his dramas, such as *Der Trifels und Palermo* (1886) and *Pokahuntas* (1905). In the lyrics and ballads there is enough marching rhythm to win him the title of "soldier poet," and there is an especial felicity in his backgrounds of Schleswig scenery and in his realistic and dramatic narrative; but, on the other hand, there is some affectation of manner. His themes are frequently erotic. His chief poetic titles are *Adjutantenritte* (1883); *Gedichte* (1889); *Neue Gedichte* (1893); *Poggfred* (1896 et seq.), a fantastic epic; *Nebel und Sonne* (1900; 4th ed., 1904); *Bunte Beute* (1903; 5th ed., 1905). His works appeared at Berlin in 14 volumes in 1904–05.

Bibliography. O. F. Bierbaum, *Freiheer Detlev von Liliencron* (Leipzig, 1892); Franz Oppenheimer, *Detlev von Liliencron* (Berlin, 1898); Franz Boeckel, *Detlev von Liliencron* (ib., 1904); H. Benzmann, *D. v. Liliencron* (Leipzig, 1904; new ed., 1912); Heinrich Spiero, *D. von Liliencron* (Berlin, 1910); H. Spiero, *D. v. Liliencron, sein Leben und seine Werke* (ib., 1913); Wilhelm Friedrich, *Dichter und Verleger:*

Briefe von Wilhelm Friedrich an Detlev von Liliencron (Munich, 1914).

LILIENCRON, Rochus, Baron von (1820–1912). A German author, born at Plön, Holstein. He studied theology, jurisprudence, and philology at Kiel, Berlin, and Copenhagen. In 1847 he became privatdocent at Bonn. After holding various government positions he became in 1850 professor at Kiel and in 1852 was appointed to the chair of German language and literature at the University of Jena. While there he published, with W. Stade, *Lieder und Sprüche aus der letzten Zeit des Minnesangs* (1854). In 1858, under the direction of the Historical Commission of Munich, he began the collection of folk songs, which culminated in his *Historische Volkslieder der Deutschen vom 13.–16. Jahrhundert* (4 vols., 1865–69). The same commission also charged him with the editing of the *Allgemeine deutsche Biographie.* In 1869 he was made a foreign member in ordinary of the Bavarian Academy of Sciences and settled in Munich. In 1879 he removed to Schleswig. From 1892 to 1900 he was editor of *Denkmäler der deutschen Tonkunst.* He published numerous valuable articles in various musical and philological journals.

LILIENTHAL, lē′lĭ-*e*n-täl′, Otto (1848–96). A German aëronautical engineer, born at Anklam, Prussia. He was educated at the trade school in Berlin, then worked for Schwartzkopff and Hoppe in that city, and in 1880 established a factory in which he manufactured several articles of his own invention. Becoming interested in aëronautics, he attempted to work out the method of successful air flying by men by exact imitation of the flight of birds, and in one of his experiments he was killed. He is author of *Der Vogelflug als Grundlage der Fliegekunst* (1889), which was translated by A. W. Isenthal as *Birdflight as the Basis of Aviation* (1911), and of *Die Flugapparate: allgemeine Gesichtspunkte bei deren Herstellung und Anwendung* (1894).

LILITH, lĭl′ĭth *or* lī′lĭth (Heb., night monster, night fairy; connected probably with *layil,* Ar. *lail,* night). A female demon mentioned in the Old Testament. The word occurs in Isaiah (xxxiv. 14) and is translated in the English versions by screech owl or night monster; it is, however, to be regarded strictly as a proper name, probably Babylonian in its origin, since in the incantation rituals of the Babylonians the demon *Lilu* and a female consort *Lilitu* occur and are pictured as sprites that plague men particularly during the night. The Jewish rabbinical writings contain many fables about Lilith. She is there regarded as a beautiful woman, the first wife of Adam; she became a demon, however, and Eve was given to Adam in her place. Lilith was believed especially hostile to children, and amulets were worn to ward off her pernicious influence.

LILIUOKALANI, lē′lē-o͞o′ō-kȧ-lä′nē, Lydia Kamekeha (1838–1917). For a time Queen of the Hawaiian Islands, sister of King Kalakaua, whom she succeeded in 1891. She married John O. Dominis, a native of Boston, who became Governor of Oahu, and through his influence she was at first favorably inclined to American interests. She was appointed Regent during King Kalakaua's last visit to the United States and at his death succeeded him on the throne. Unfortunately her husband died soon afterward, and the Queen allowed herself to be influenced by unworthy counselors. She secured the passage of bills authorizing the importation of opium and the establishment of the Louisiana lottery and endeavored to substitute a reactionary constitution for the liberal one of 1887. This last measure aroused the white population of the islands, who would have been disfranchised under the proposed constitution, and on Jan. 30, 1893, they deposed her and set up a provisional government which soon became a Republic, with Sanford B. Dole (q.v.) at its head. The new government immediately sought to secure the annexation of the islands to the United States; but President Cleveland opposed this policy and, on the ground that United States forces had been used to dethrone the Queen, demanded that the republican government restore her to power. This Dole and his advisers refused to do, and after a show of force President Cleveland was compelled to acquiesce. The ex-Queen visited the United States in order to plead her cause and then retired to her private estate in Honolulu. In 1908 she made a claim on the United States government for $450,000, but the Court of Claims decided against her two years later. She was granted a pension by Congress of about $40,000. In 1914 she visited Hawaii after a long residence in San Francisco and expressed great pleasure at the rapid strides in civilization made by her former subjects under American rule. See Hawaiian Islands.

LILJEFORS, lĭl′yĕ-fôrs′, **Bruno (Andreas)** (1860–). A distinguished Swedish painter of animals and landscapes. He was born at Upsala and studied at the Academy of Arts in Stockholm and for a short time under Deiker in Düsseldorf. After traveling in Germany, Italy, and France, and absorbing, without imitating, all modern tendencies, including the Japanese conception of nature and movement, he returned to Sweden and developed a very original art, both in choice and treatment of subject. With an intimate knowledge of natural history and the keen observation of the hunter and explorer, he painted animals and birds in the solitude of the forest or the sea. His earlier paintings are characterized by minute detail and marvelous vivacity of movement. After his removal to the Stockholm Archipelago in 1890 his work increased in boldness of treatment, with a rendering of atmospheric and light effects often unique. Many of his finest paintings, including "Sunrise," "Eider Ducks," "Hare in the Snow," "Snipe," "The Panther's Skin," and "Swans," are in the Thiel Gallery in Stockholm. Among those in the National Gallery, Stockholm, are "Common Curlew" and "A Fox Family." Four excellent examples of his art—"Foxes," "The Hunter," "Fox Hunting," and "Birds in the Snow"—were exhibited at the Scandinavian Art Exhibition in New York in 1912. Liljefors received gold medals at Munich and Berlin. Consult Tor Hedberg, *Bruno Liljefors* (Stockholm, 1902).

LILLE, lēl (Flem. *Ryssel*). The capital of the Department of Nord, France, a first-class fortress and one of the principal manufacturing centres of the Republic (Map: France, N., H 2). It is situated in a level district on the navigable Deule, about 7 miles from the Belgian frontier and 154 miles by rail north-northeast of Paris. Its fortifications, rebuilt almost entirely during the nineteenth century, consist of an extensive enceinte with numerous forts, and the pentagonal citadel at the northwestern end of the town, designed by Vauban. Lille is practically a modern town, the portion south of the Boulevard de la Liberté (formerly the southern limit of the fortifications and now the centre of the town) having been annexed at the reconstruction of the fortifications in 1858–66. It is well laid out and has fine squares, avenues, and boulevards, which are traversed by a number of street railways. There are few ancient buildings of note; the principal churches are those of St. Catharine (built during the fifteenth, sixteenth, and eighteenth centuries, and containing a painting by Rubens, "The Martyrdom of St. Catharine"), St. Madeleine (seventeenth century), St. Andrew (eighteenth century, with paintings by Flemish masters), and St. Maurice. Of these, the only one of considerable architectural importance is St. Maurice. It is in the late Gothic style, the oldest parts dating from the fifteenth century, and was restored in 1872. The church of Notre Dame de la Treille, a grand edifice in the style of the thirteenth century, was begun in 1855. The secular edifices include the Bourse, dating from 1652, with a court surrounded by arcades and containing a bronze statue of Napoleon I by Lemaire; the modern town hall (1847–59), with the communal library and a museum of engravings; and the prefectural building. The Palais des Beaux-Arts, opened in 1892, has one of the largest collections of paintings to be found in a provincial town in France, containing many canvases by Flemish, French, and Italian masters; a collection of about 1500 drawings, chiefly by the Italian masters, collected by the painter Vicar, a native of Lille; collections of antiquities, sculptures, medals, and coins, and the noted ethnographical collection of Moillet. Lille is well provided with educational institutions. The chief of them are the State University, founded in 1808, with four faculties, an attendance of 1828 in 1912–13, and a library of 407,000 volumes; a Catholic university, with five faculties and an attendance of 550; a technical high school; a lycée, an art school, a conservatory of music, a theatre, botanical and zoölogical gardens, and several scientific associations. The communal library contains 100,000 volumes, over 1430 manuscripts, including about 200 incunabula. Lille has long been noted for its industrial activity, especially in the textile industry. It is full of manufacturing establishments for the production of linen, velvet, ribbons, knit ware, etc., which form its chief products. There are also manufactured machinery, various instruments, chemicals, soap, sugar, trimmed lumber, tobacco, oil, etc. The trade in local manufactures, agricultural and colonial products, is extensive. Lille is the seat of a number of foreign consular agents. The population of the city was largely augmented by the annexation of the suburbs during the second half of the nineteenth century. From 75,000 in 1856 it rose to 158,117 in 1872, 201,211 in 1891, and 216,276 in 1896; it fell to 210,696 in 1901, and 205,602 in 1906, but rose to 217,807 in 1911. These figures are for the commune.

Lille grew up around the castle of Buc in the eleventh century. It was fortified by Count Baldwin IV of Flanders in 1030 and by the twelfth century had become one of the chief commercial cities of Flanders and the centre of an extensive linen industry. It suffered much from the struggles between the counts of Flanders and the kings of France and passed to the latter at the beginning of the fourteenth century. Lille regained its prosperity with its passing to the dukes of Burgundy in 1369. It subsequently came into the possession of Austria and then of Spain and was conquered by Louis XIV in 1667. It was gallantly defended by Boufflers against Prince Eugene in 1708, but was finally reduced. Another notable event in its annals is its heroic resistance during the siege by the Austrians in 1792. Again, in the European struggle which broke out in 1914, Lille suffered from the rigors of war. For months it was the centre of furious battles between the German and allied English, French, and Belgian armies. It was occupied first by one and then by the other. Several of the buildings of the city were destroyed by the heavy German artillery. It was also forced to pay a large war tribute while in German hands. See WAR IN EUROPE. Consult Edouard van Hende, *Histoire de Lille* (Lille, 1874).

LILLEBONNE, lĕl'bŏn'. An ancient town in the Department of Seine-Inférieure, France, situated 20 miles east of Havre in the valley of the Bolbec (Map: France, N., F 3). It has a ruined castle built by William the Conqueror, an ancient donjon, and numerous Roman remains, including the ruins of a theatre. Cotton goods are manufactured. Lillebonne, the ancient *Juliobona*, capital of the Caletes, was destroyed by Julius Cæsar and rebuilt by Augustus. It was of considerable importance under the Roman rule. Pop., 1901, 6425; 1911, 4843.

LIL'LIBULE'RO. An Irish ballad with the refrain: *Lillibulero bullen a la.* It was composed in or about 1687 as a satire on the administration of Tyrconnel as Lord Deputy in Ireland, attained great popularity, and was a source of much strength to the anti-Jacobites during the English revolution of 1688 and the early years of the reign of William and Mary. The ballad is attributed to Lord Wharton and the musical setting to Henry Purcell, but there is much uncertainty as to Purcell's part in it.

LIL'LIE, FRANK RATTRAY (1870–). An American zoölogist. Born at Toronto, Canada, he graduated from the university of that city in 1891, and then studied at Clark University (1891–92) and at the University of Chicago (Ph.D., 1894). Afterward he was instructor in zoölogy at the University of Michigan (1894–99); professor of biology at Vassar College (1899–1900); and at Chicago assistant professor and associate professor of zoölogy and embryology from 1900 to 1907, professor after 1907, chairman of the department of zoölogy after 1911, and associate curator of the Zoölogical Museum after 1902. In addition he served as head of the department of embryology (1893–1907), assistant director (1900–08), and director after 1908 of the Marine Biological Laboratory, Woods Hole, Mass. He became managing editor of the *Biological Bulletin* in 1902, and associate editor of the *Journal of Experimental Zoölogy.*

LILLIPUT, lĭl'ĭ-pŭt. The name of a fabulous kingdom described by Jonathan Swift (q.v.) in *Gulliver's Travels* (1726). The Lilliputians were no bigger than a man's finger. The term Lilliputian means a tiny dwarf, or almost anything on a very small scale.

LIL'LO, GEORGE (1693–1739). An English dramatist. A jeweler by trade, he made dramatic composition his avocation. With a vigorous style and a moral tendency in advance of his time, he was the representative of the domestic manners and tastes of the middle classes. His plays *Silvia* and *The London Merchant, or The History of George Barnwell*, appeared in 1730 and 1731. The latter was extremely popular, and, if not intrinsically of high value, is important for its influence—an influence which can be directly traced—upon the sentimental drama both in France and Germany, reaching the latter country through Lessing. His other works are: *The Christian Hero* (1735); *Fatal Curiosity* (1736); *Marina* (1738), an adaptation of Shakespeare's *Pericles; Elmerick* (1740); and a version, completed by John Hoadley, of *Arden of Feversham* (1759). Consult Leopold Hoffman, *George Lillo* (Marburg, 1888), and *Lillo's Dramatic Works with Memoirs of the Author by Thomas Davies* (reprint, London, 1910).

LILLOOET, lĭl′o͞o-ĕt (wild onion). One of the four principal Salishan tribes in the interior of British Columbia. See SALISHAN STOCK.

LIL′LY, JOHN. An English writer of the sixteenth century, author of *Euphues*. See LYLY.

LILLY, WILLIAM. See LILY, WILLIAM.

LILLY, WILLIAM (1602–81). An English astrologer, born in Leicestershire. As a young man he was employed as bookkeeper by a London merchant, later took up the study of astrology, particularly the *Ars Notoria* of Cornelius Agrippa, and soon became widely known as a caster of nativities and predicter of future events. From 1644 till his death he annually issued his *Merlinus Anglicus Junior*, an almanac, containing vaticinations to which considerable importance was attached by many. His *Monarchy or No Monarchy* (1651) included, among other hieroglyphical engravings, two which he subsequently asserted predicted the plague and fire of 1666. In the Civil War he was sent to the Parliamentary camp at Colchester, to encourage the troops. After the Restoration he was for some time imprisoned, on the supposition that he was acquainted with the secrets of the Republicans. He was satirized in *Hudibras*. His chief work was the *Christian Astrology* (1647). An *Autobiography* appeared posthumously in 1715. His books and pamphlets were too numerous to chronicle here. His most notable work outside of astrology was *True History of King James I and King Charles I* (1651).

LILY (AS. *lilie, lilige*, from Lat. *lilium*, from Gk. *λείριον, leirion*, lily), *Lilium*. A large genus of bulbous plants of the family Liliaceæ, containing many species prized for their size and the beauty of their flowers. The bulb is scaly, the stem herbaceous and simple, often several feet tall; the flowers, borne at or near the summit, bell-shaped, the segments of the perianth often reflexed. The white lily (*Lilium candidum*), a native of southern Europe and the Levant, long cultivated in gardens, has large, erect, pure white flowers. The orange lily (*Lilium bulbiferum*), a native of the south of Europe, with large, erect, orange-colored flowers, is a well-known and very showy ornament in flower gardens. The Turk's-cap lily (*Lilium martagon*), a native of the south of Europe, and allied species with verticillate leaves and drooping flowers, are also common in gardens. The tiger lily (*Lilium tigrinum*), a native of China, is remarkable for the axillary buds which become detached and take root to form new plants that flower in from two to three years. Some very fine species are natives of North America, among them *Lilium superbum*, also called Turk's-cap lily, which grows in low ground in the United States, with stems 3 to 7 feet high, and reflexed orange flowers, spotted with black; *Lilium canadense*, the wild yellow lily; *Lilium philadelphicum*, wood lily; *Lilium catesbœi*, southern red lily; etc. Several very fine species have been introduced from Japan, as *Lilium japonicum, Lilium speciosum*, and *Lilium lancifolium*. *Lilium cordifolium* is a magnificent species, native of the Himalayas. *Lilium longiflorum*, var. *harrisii*, the Bermuda Easter lily, is largely grown in greenhouses for winter blooming, especially for the Easter festival. The bulbs of several species are used as food in Oriental countries. Lilies are distributed throughout the north temperate zone and are grown under various conditions of climate and soil. The plants require considerable moisture during their rapid growth, but the soil must be well drained to prevent injury to the bulbs. They are propagated by offset bulbs and single scales. New varieties are grown from seeds. Consult William Goldring, *Book of the Lily* (New York, 1905). See Colored Plates of LILIACEÆ; CALIFORNIA FLORA.

LILY, GIANT, SPEAR, or GIGANTIC. See GIANT (or SPEAR) LILY.

LILY, STONE. See CRINOIDEA.

LIL′Y, or **LILLY**, WILLIAM (c.1468–1522). A celebrated English grammarian, born at Oldham. He graduated at Oxford, afterward traveled in the Orient to perfect his knowledge of the Greek language, and passed a number of years in study at Rhodes, Rome, and Venice. Returning to London about 1509, he taught privately there for some time, was appointed by Colet first head master of St. Paul's School in 1512, and became one of the chief exponents of the "new learning." He was a joint author of the famous *Eton Latin Grammar* and wrote also various Latin pieces, both in prose and in verse. It is probable that he was the first teacher of Greek in London.

LIL′YBÆ′UM PROM′ONTO′RIUM (Lat., from Gk. *Λιλύβαιον, Lilybaion*). The ancient name of Cape Boeo, the western extremity of Sicily. From it to Cape Bon is the shortest distance between Africa and Sicily. Here in 397 B.C. the Carthaginians founded the city of Lilybæum (modern Marsala, q.v.) to take the place of Motye, which Dionysius had destroyed. In 279 B.C. Lilybæum was besieged unsuccessfully by Pyrrhus, and in the First Punic War the Romans endeavored in vain to reduce it; but in the final treaty of peace it was conceded to them. They made it the starting point of the African expeditions, and the strongest fortress and most splendid city in west Sicily. Its massive walls were surrounded by a moat 40 feet deep and 60 feet wide. Consult Otto Meltzer, *Geschichte der Carthager*, vols. i–ii (Berlin, 1879 et seq.), and the article "Lilybæum" in Friedrich Lübker, *Reallexikon des classischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

LILY FAMILY. The common name of Liliaceæ (q.v.).

LILY MAID OF ASTOLAT, THE. Elaine, the maiden who died for love of Lancelot.

LILY OF THE PALACE. See Plate of AMARYLLIDACEÆ.

LILY OF THE VALLEY (*Convallaria majalis*). A well-known ornamental plant, the single representative of its genus, of the family Liliaceæ. It grows in bushy places and woods in Europe, northern Asia, and in the southern Alleghany region of North America, and is also largely cultivated. The plant grows from an underground rootstock, and usually produces two ovate lance-shaped leaves from 6 to 8 inches long. In May or June the scape with its small, white, six-lobed, bell-shaped, drooping flowers appears as a terminal, one-sided raceme. The fruit of the plant is a few-seeded red berry, about as large as a pea. The berries, roots, and flowers have a nauseous, bitter, and somewhat acrid taste, and are credited with purgative and diuretic effects. The flowers are used in the manufacture of *eau d'or*, an esteemed French perfume. Cultivation has given rise to a number of varieties with red, variegated, and double flowers. The plant succeeds almost everywhere, but makes an especially fine growth in moist, shady places on a rich sandy, well-drained loam. It is propagated by the crowns or strong terminal buds (pips) of the rootstocks. These may be obtained from established beds in the fall, but in the United States they are generally imported. The lily of the valley is largely forced by florists, who obtain blossoms nearly all the year round. See Colored Plate of LILIACEÆ.

LIMA, lē′mȧ. A maritime department of Peru, bounded by the Department of Ancachs on the north, Junin on the east, Huancavelica on the south, and the Pacific Ocean on the west (Map: Ecuador, B 6). Area, 13,314 square miles. The surface is very mountainous, and many peaks are covered with perpetual snow. The west part slopes gradually towards the sea, and has a number of fertile valleys along the river courses, although large areas are occupied by sterile sand wastes. Sugar cane is the principal crop raised in the valleys, which are among the most populous regions in Peru. Minerals are supposed to exist in large quantities, but there is very little mining. Pop. (est.), 300,000. The capital is Lima (q.v.). The seaport, Callao, with a few miles of the surrounding country, forms a separate province.

LIMA. The capital of Peru. It is situated on the Rímac, 7 miles from where it flows into the Pacific Ocean and from the port of Callao (q.v.), in lat. 12° 3′ S., long. 77° 8′ W. (Map: Ecuador, B 6). The elevation above sea level is about 500 feet. The climate differs somewhat from that of the arid coast; in winter the air feels even chilly on account of the dense fogs which then prevail, and which render the climate very unhealthful. Rain, however, is unusual. The city is laid out in the form of a triangle, and the streets, though narrow, are straight and cross at right angles. The old city was surrounded by adobe walls built in 1585; they were razed in 1870, and their site converted into boulevards. There are several handsome promenades adorned with shade trees and statues, and numerous squares, the foremost of which are the Plaza de Bolívar, containing a fine equestrian statue of the liberator, and the Plaza Mayor, with a bronze fountain in the centre. On this plaza stand the cathedral and archbishop's palace, the city hall, and the government building. There should also be mentioned the Plaza del Acho, on the north side of the river, the site of the bull ring. There are no parks properly so called, but the Exposition grounds form a beautiful pleasure garden with palaces, pavilions, and statues, besides zoölogical and botanical gardens. The houses of Lima are as a rule roomy two-story structures built in the Spanish style with a central *patio* or courtyard. They are almost invariably built of adobe stuccoed with plaster. Foremost among the buildings stands the cathedral, with a beautiful Moorish façade and two lofty towers; it was begun in 1535 and consecrated in 1625. It was destroyed by the earthquake of 1746, but by 1758 was reconstructed. After the cathedral, the finest church in Lima is probably that belonging to the convent of San Francisco, near the Plaza Mayor; other notable churches are those of the convents of San Agustin, La Merced, and Santo Domingo. Altogether the churches, chapels, etc., of the city number nearly 70. There are several fine hospitals.

The national University of San Marcos, the oldest in America, founded in 1551, has faculties of theology, law, medicine, philosophy and letters, mathematics and science, and political and administrative science. There are also schools of engineering, agriculture, and navigation, a military and a naval academy, and over 100 minor schools. There are, besides, an athenæum, scientific and literary societies, where public lectures are given, and several valuable libraries, among which the foremost is the National Library, which was founded in 1822, and contained 60,000 volumes before it was destroyed by the Chileans in 1880; it now contains about 50,000 volumes. During the present century increasing attention has been given to general elementary education. Lima has developed rapidly in recent years; since the razing of the walls in 1870, the suburbs have thoroughly grown into the city itself, which has been greatly extended. The public works are in good condition; the city is lighted by electricity, and it has an excellent water supply and sewerage system. The water is obtained by direct filtration from the Rímac into subterranean chambers, from which it is brought to the city in pipes and distributed by the gravity system. The Oroya Railway, running from the port of Callao across the Cordilleras, is here intersected by a railroad running northward through the province. The manufactures of the city include furniture, iron and copper articles, pottery, and dyestuffs. Outside the city limits there are important manufactories of textiles, sugar, cocoa, liquors, etc. The population (1913) is estimated at 143,000, the greater part being mestizo or Indian.

Lima was founded in 1535 by Francisco Pizarro, who called it Ciudad de los Reyes (city of the kings). Its later name, Lima, is a corruption of Rímac, the name of the river. During Spanish colonial times it was the capital of the Viceroyalty of Peru, which then included the greater part of Spanish South America. In 1880–81 Lima was occupied by the Chilean army, which destroyed many of its finest treasures and monuments. Consult: E. W. Middendorf, *Peru*, vol. i (Berlin, 1893); C. Pradié-Fodéré, *Lima et ses environs* (Paris, 1897); C. R. Enock, *Peru, its Former and Present Civilization, History and Existing Conditions, Topography and Natural Resources, Commerce and General Development* (London, 1908); id., *The Andes and the Amazon* (ib., 1910).

LIMA, lī′mȧ. A village in Livingston Co., N. Y., 18 miles south of Rochester, on the Lehigh Valley Railroad (Map: New York, C 5). It is the seat of Genesee Wesleyan Seminary. There are extensive insulator works near by, a bottle-washing-machine factory, and large celery and lettuce gardens. The water works are owned by the municipality. Pop., 1914 (local est.), 900.

LIMA, lī′mȧ. A city and the county seat of

Allen Co., Ohio, 81 miles by rail south of Toledo, on the Ottawa River and on the Cincinnati, Hamilton, and Dayton, the Erie, the Lake Erie and Western, the Detroit, Toledo, and Ironton, the Lake Shore Electric, the Western Ohio, the Ohio Electric, and the Pennsylvania railroads (Map: Ohio, B 4). It is the seat of the Ohio State Hospital for the Criminal Insane, one of the largest institutions of its kind in the world. The industries include several large railroad shops, extensive manufactories of locomotives, cars, and machinery, and petroleum refineries. Lima ships large quantities of oil. The water works are owned and operated by the municipality. Pop., 1900, 21,723; 1910, 30,508; 1914 (U. S. est.), 33,904; 1920, 41,306.

LIMA BEAN. See Bean, and Plate of Legumes.

LIMAÇON, lĕ′mȧ′sôɴ′ (Fr., snail). A special form of the Cartesian curves. It was invented by Pascal (1623–62) and named by Roberval. Its rectangular equation is $(x^2 + y^2 - 2ax)^2 = a^2(x^2 + y^2)$ and its polar equation $r = 2a\cos\theta + k$. Consult Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897; and supplement, 1899). See Cartesians; Cardioid.

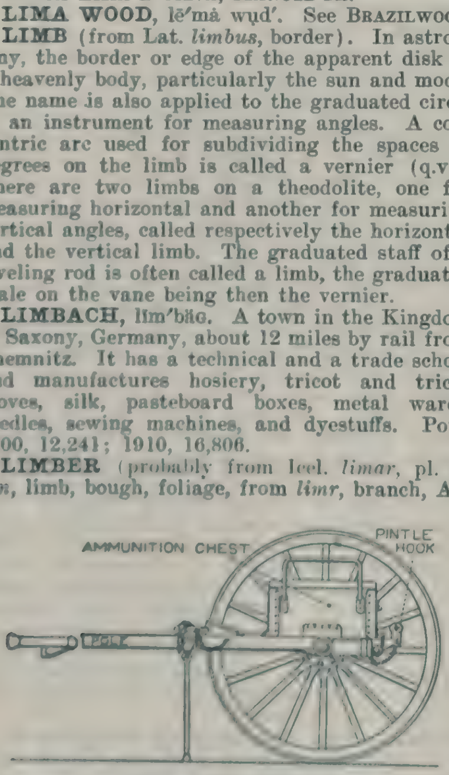
LIMA E SILVA, lē′mȧ ȧ sêl′vȧ, Luiz Alves de. See Caxias, Luiz Alves de Lima e Silva, Duke of.

LIMA E SILVA, Manoel da Fonseca. See Fonseca Lima e Silva, Manoel da.

LIMA WOOD, lē′mȧ wụd′. See Brazilwood.

LIMB (from Lat. *limbus*, border). In astronomy, the border or edge of the apparent disk of a heavenly body, particularly the sun and moon. The name is also applied to the graduated circle of an instrument for measuring angles. A concentric arc used for subdividing the spaces or degrees on the limb is called a vernier (q.v.). There are two limbs on a theodolite, one for measuring horizontal and another for measuring vertical angles, called respectively the horizontal and the vertical limb. The graduated staff of a leveling rod is often called a limb, the graduated scale on the vane being then the vernier.

LIMBACH, lĭm′bȧG. A town in the Kingdom of Saxony, Germany, about 12 miles by rail from Chemnitz. It has a technical and a trade school and manufactures hosiery, tricot and tricot gloves, silk, pasteboard boxes, metal wares, needles, sewing machines, and dyestuffs. Pop., 1900, 12,241; 1910, 16,806.



LIMBER OF FIELD GUN.

LIMBER (probably from Icel. *limar*, pl. of *lim*, limb, bough, foliage, from *limr*, branch, AS. *lim*, Eng. *limb*). The forward element of the gun carriage of a fieldpiece. It is a two-wheeled structure fitted with a box or boxes for the necessary ammunition and a pole or shafts to which the horses are harnessed. Like the caisson, it is a steel chest mounted on a single pair of wheels and is quickly attached to and detached from the gun or caisson by means of a strong hook, known as the pintle hook. During action the horses remain hitched to the limbers, which are detached from the guns and caissons and removed to the nearest place of safety. The number of rounds of ammunition carried in the limber is considerably less than that carried in the caisson (36 as against 70 with the American 3-inch equipment) and is generally reserved for use in an emergency. See Field Artillery; Caisson.

LIMBORCH, lĭm′bôrĸ, Philipp van (1633–1712). A Dutch Protestant theologian. He was born at Amsterdam and was educated at Utrecht University. He served as pastor at Alcmar, at Gouda (1657–67), and (1667–1712) at Amsterdam, where in 1668 he became also professor of theology in the Remonstrant Seminary. His writings include his chief work, *Institutiones Theologiæ Christianæ* (1686; 5th ed., 1735; Eng. trans., 1702); *De Veritate Religionis Christianæ* (1687); *Historia Inquisitionis* (1692; Eng. trans., 1731); *Commentarius in Acta Apostolorum et in Epistolas ad Romanos et ad Hebræos* (1711).

LIMBS, Artificial. See Artificial Limbs.

LIMBURG, lĭm′bụrĸ, Josef Wilhelm Carl (1874–). A German sculptor. He was born at Hanau-on-the-Main, and studied there at the Royal Academy and later under Tilgner in Vienna and Janensch in Berlin, where he won the Roman prize in 1900. After spending a number of years at Rome, he located definitely at Berlin. Among his principal works are the marble monument to Pope Gregory XIII, in the vestibule of the German College in Rome (1901); half-length portrait statue of Pope Pius X (1904), in the Vatican (replica in the Museum of Grottaferrata); portrait statue of the sculptor Gerhardt (1902), in the Accademia di San Luca, Rome; marble bust of Minister of State Von Delbrück (Imperial Bank, Berlin); monument of Count and Countess Ballestrem, in Ziegenhals; statue of Arnold Borsig, on the Borsig Bridge, Berlin, and a Madonna, in the church of Zehlendorf. His ideal works include the bronze groups "Repentance" and "The Power of Sounds."

LIMBURG-ON-THE-LAHN. An old episcopal town in the Province of Hesse-Nassau, Prussia, 32 miles east of Coblenz. The river is here crossed by a bridge dating from 1315. The town has a magnificent cathedral, originally erected in the thirteenth century, and now restored. It is built in Transition style, with seven towers. There are a seminary for priests, an old castle, a new town hall, a Gymnasium. The town produces machinery, tinware, soap, and bricks. There are in the vicinity large iron mines, with foundries and large railway shops. Pop., 1900, 8465; 1910, 10,965. Limburg has in its possession the famous fourteenth-century historical document known as the "Limburger Chronik" or "Fasti Limburgenses," which contains interesting information about German folklore and music of the fourteenth century.

LIM′BUS (Lat., border). The name assigned in Roman Catholic theology to that place or condition of departed souls in which those are detained who have not offended by any personal act of their own, but nevertheless are not admitted to the divine vision. A distinction is made between *limbus patrum* and *limbus in-*

fantum. By the former name is understood the place of the just who died before the coming of the Redeemer, and of whom it is said (1 Pet. iii. 19) that he preached to those spirits that were in prison. By the latter is meant the place or state of souls of infants who die without baptism, and who suffer no torment, but are not considered capable of the beatific vision of God which is the chief joy of heaven. See INTERMEDIATE STATE; HELL.

LIME (Fr. *lime,* from Pers. *līmū, līmūn,* lemon), *Citrus medica acida,* also called *citrus aurantifolia.* A small tree of the same species as the lemon, seldom more than 8 feet in height, with an irregular spreading habit of growth and crooked trunk. The fruit is similar to that of the lemon, but smaller and more nearly globular in outline, more acid and with a thinner rind. The plant is a native of India and China, cultivated in the south of Europe, the West Indies, and Florida, where it is frequently found as an escape. The lime is chiefly valued as a source of citric acid and for lime juice, which is extensively used on shipboard as an antiscorbutic. It is also used to make limeade, a pleasant beverage. The limes on the American markets are mostly derived from Florida or the West Indies. The lime is propagated by cuttings or buds like the lemon and requires similar treatment as an orchard tree. See Colored Plate of CITRUS FRUITS.

LIME, or CALCIUM OXIDE, CaO. A well-known compound of calcium and oxygen, produced by heating some form of calcium carbonate or calcium nitrate. Being an energetic base, lime readily combines with acids, even carbonic acid, and hence is not found free anywhere in nature. The forms of calcium carbonate technically used for the manufacture of lime, all more or less impure, include limestone, marble, calc-spar, sea shells, etc. The best lime is yielded by the densest limestones, the quality of the lime depending further upon the duration of the heating process and the degree of heat to which the limestone is subjected. The heating process is carried out in kilns, a good draft being required to render it effective. It is well that the limestone should contain a certain amount of moisture, the latter aiding the decomposition of the carbonate. Various methods have been devised for adding moisture to the carbonate during the process of heating; thus, a current of steam passed over the carbonate, or a spray of water thrown upon it from time to time, accelerates the process very effectively. The limestone was formerly heated in heaps or ditches, but at present this is scarcely ever practiced on a large scale, the process being carried out in either intermittent or continuous kilns, the type of which is chosen according to the available fuel. The most efficient kiln is the ring kiln, or Hoffmann kiln. (See KILN.) Nearly as efficient, and more generally used, are vertical chamber kilns. (See KILN, *Continuous Kilns.*) The kilns may be provided with fireplaces, the fuel and the limestone being separated; or else there may be no separate fireplace, the limestone being charged together with the fuel. The latter form of kilns is convenient for most ordinary purposes; but if it is desired to produce a lime of high quality and of a pure white color, fireplace kilns alone should be employed. An economical form of kiln largely used at present is the iron-shell draw kiln, which holds the materials in a shell of heavy tank iron.

Pure calcium oxide (quicklime, or burned lime) is a perfectly white substance having the specific gravity 3.15. It is not affected by heat. When brought into contact with water, it forms the hydroxide $Ca(OH)_2$, commonly known as *slacked lime,* the ease with which the transformation takes place depending largely upon certain details of the process employed in making the quicklime, such as the duration of the process, the degree of temperature, etc. Calcium hydroxide has a much lower specific gravity (2.08) than quicklime. When shaken up in water, it remains in suspension for a considerable length of time, forming what is known as milk of lime. A small amount of the lime actually goes into solution and on filtering may be precipitated by carbon dioxide, with which the hydroxide readily forms calcium carbonate, while quicklime refuses to absorb the gas at ordinary temperatures. Unlike that of most other substances, the solubility of lime in water decreases as the temperature increases, and hence clear limewater becomes turbid when boiled. When mixed with peroxide of hydrogen, limewater yields an unstable hydrated *calcium peroxide,* $CaO_2.8H_2O$, which separates in the form of minute crystals.

Lime is used for a variety of purposes in the arts. It is much used in the production of raw cane sugar chiefly for the purpose of neutralizing the organic acids present in the extracted juice, forming with them chemical compounds that can be readily separated. It is also used in the purification of molasses and cane and beet sugar of inferior grades. To recover the sugar, the lime compound is treated with carbon dioxide, which combines with the lime and sets free the sugar. Strontia can be used instead of lime. Lime is extensively used in making mortars and cements for building purposes and in manufacturing artificial stone and glass. It is often employed as a medicinal agent, being prepared for this purpose from the purest varieties of calcium carbonate. It is prescribed mainly in the forms of limewater (sometimes mixed with glycerin), lime liniment (carron oil, made by mixing equal volumes of limewater and linseed oil), sirup of lime (made up of lime, sugar, and water), and Vienna paste (lime and caustic potash). Lime liniment is used for burns, although a strong solution of picric acid (q.v.) is preferred by many. A mixture of limewater with glycerin is useful in weeping eczema. Limewater (with milk) is also often administered internally, especially for the purpose of allaying vomiting in infants. A saturated solution of saccharate of lime in calcium hydroxide, commonly known as viscogen, has been used to increase the viscosity of separator cream. For this purpose 0.5 to 0.75 per cent is employed. Lime is the most important alkaline material for technical purposes. Among its many uses may be cited, first, softening of water; second, preparation of caustic soda or potash lye for any purpose, both depending on the removal of carbon dioxide in the form of insoluble calcium carbonate; third, neutralization of excess acid in soil and increase of available calcium plant food; fourth, base for the formation of acid calcium sulphite in wood-pulp process; fifth, development of gaseous ammonia. The carbon dioxide produced in the manufacture of lime may be collected and utilized. (See CARBONIC-ACID GAS.) Consult: Q. A. Gillmore, *A Practical Treatise on Limes* (New York, 1896); Frash, "Lime and Lime Burning," in *The Mineral In-*

dustry (ib., 1899); F. H. Thorp, *Outlines of Industrial Chemistry* (ib., 1911); Sir T. E. Thorpe, *Dictionary of Applied Chemistry* (ib., 1912). For information on the carbonates of lime, see Limestone; Marble; Calcite; Iceland Spar; Chunam; Aqueous Rocks. For the sulphate of lime, see Gypsum; Sulphuric Acid. For the nitrate of lime, see Nitric Acid. For the phosphates of lime, see Phosphorus; Manures and Manuring. For chloride of lime, see Bleaching Powder.

LIME, Chloride of. See Hypochlorous Acid; Bleaching Powder.

LIME′LIGHT′. See Drummond Light.

LI′MEN (Lat., threshold). A metaphorical expression introduced into psychology by Herbart. The ideal boundary or limit, which ideas or representations may be said to cross on becoming conscious, was termed by him the "limen of consciousness." The word was then transferred by Fechner to psychophysics, where it is now employed in two principal connections. 1. The effect of a stimulus upon the organism may, for various reasons, be so slight as to produce no change in consciousness. A sound may be too faint, a point of light too small, a scent too weak, to arouse the corresponding sensation; or, on the affective side, an occurrence in the outside world may be of so little importance to us that we take it indifferently, are not "affected" by it whether pleasantly or unpleasantly. All stimuli of this kind are called subliminal. On the other hand, stimuli of a certain intensity or duration or extent, and occurrences of a certain importance, never fail under ordinary circumstances to evoke a conscious response; such stimuli are called supraliminal. Between the two lies the ideal and variable stimulus which is just able to arouse a sensation or induce an affection. This just noticeable stimulus, or *stimulus limen,* may be defined as the stimulus which calls forth the judgment "present" in one-half of a long series of observations, while in the other half the judgment is "absent" or "doubtful": such a stimulus value may be taken as the mathematical equivalent of the stimulus which, if all sources of error were eliminated, would in fact be just noticeable, barely perceptible. In the sphere of sensation the limen may be intensive, qualitative, extensive, or temporal. We may seek to determine, e.g., the least intensity of pressure that will excite a sensation in the cutaneous pressure organs, or the least intensity of sound that can still be heard; the smallest area of pressure or of light that is able, under constant conditions of duration and intensity, to produce sensation; the least number of air vibrations that can arouse the tonal quality with which their period corresponds; the least duration of a given color or temperature that can evoke its appropriate sensation. The limen of attributive clearness seems not to have been investigated, though there is ground for the belief that it is closely bound up with the limen of intensity. The affective limens, also, owing in part to difficulties of experimentation, but chiefly to the dependence of the affective reaction upon the whole contents of consciousness, have not yet been worked out. 2. What holds of stimuli holds, further, of differences between stimuli. Two colors may be so nearly alike as to be sensed identically; the difference of stimuli is subliminal. Or they may be so different as normally to be sensed differently; the difference of stimuli is supraliminal. Between the two lies a color difference that (in the sense already explained for the stimulus limen) is just noticeable; such a difference is called the *difference limen.* The ascertainment of this value is of extreme importance in psychophysics; its absolute or relative constancy, for a series of stimulus values, determines the absolute or relative constancy of the sensible discrimination. (See Discrimination, Sensible.) It may be determined for any attribute of sensation and, in theory, for the attributes of affection. The most elaborate of the metric methods of psychophysics (q.v.) are concerned with it.

The concept of the limen has played no considerable part in functional psychology. Wundt distinguishes the limen of consciousness from that of attention or apperception; any impression which has passed the limen of consciousness is able, "provided the subjective factor of attention be superadded," to pass the limen of apperception. This view is connected with his peculiar theory of apperception, and more especially with his psychological interpretation of Weber's Law (q.v.). Consult: J. H. Herbart, *Sämmtliche Werke,* vol. v (Leipzig, 1886); E. B. Titchener, *Experimental Psychology,* vol. ii (New York, 1905); G. T. Fechner, *Elemente der Psychophysik,* vol. i (3d ed., Leipzig, 1907); Wilhelm Wundt, *Physiologische Psychologie* (ib., 1908–11); Oswald Kuelpe, *Outlines of Psychology,* translated by E. B. Titchener (New York, 1909).

LIME PLANTS. Plants which grow naturally in soils or rocks rich in calcareous compounds. See Rock Plants.

LIM′ERICK. An inland county of the Province of Munster, Ireland, separated by the Shannon on the north from Clare and bounded east by Tipperary, south by Cork, and west by Kerry (Map: Ireland, C 6). Area, 1064 square miles. A mountainous district on the west belongs to the great coal tract of Munster, but the coal is of an inferior quality and is chiefly used for the burning of lime. The soil in general is fertile, especially in the district called the Golden Vale. The river Shannon is navigable for seagoing vessels as far as the city of Limerick. The agriculture of the county is backward, and two-thirds of the area is devoted to grazing; pigs and poultry are largely raised. The capital is Limerick. Pop., 1841, 331,000; 1901, 146,000; 1911, 142,846.

LIMERICK. A city, civic county, and port, capital of County Limerick, Ireland, on the Shannon, 120 miles west-southwest of Dublin (Map: Ireland, C 6). It occupies both sides of the river, together with King's Island. It is divided into the English town, the oldest part of the city connected with the extensive suburb of Thomond Gate on the Clare side of the Shannon, and the Irish town, which extends on the south bank of the river into Newtown Pery, the best part of Limerick. The gas works, water supply, and other public utilities are municipal property. Among the noteworthy buildings are St. John's Catholic Cathedral and St. Mary's Anglican Cathedral, dating from 1179. Limerick is a military station for infantry, artillery, and cavalry, with barracks within the walls of King John's Castle, an important and well-preserved old Norman fortress defending Thomond Bridge. The Shannon, crossed by several bridges, is navigable for ships of large burden and is connected with Dublin by the Grand Canal in King's County and the Royal Canal near Longford.

The river is canalized to the head of Lough Allen. The graving dock admits vessels of 2500 tons, and there is a patent slip for vessels of 500 tons and a floating dock for vessels of 3000 tons. The industries include the manufacture of the celebrated Limerick fishhooks, flour milling, bacon curing, lace manufacturing, tanning, etc. The manufacture of clothing for the British army gives employment to more than 1500 persons, and there is a flourishing butter and condensed-milk industry. A large import trade is carried on, Limerick ranking fourth among Irish ports. The chief exports are oats, bacon, butter, condensed milk, and salmon; imports, grain, petroleum, sugar, and timber. The United States is represented by a consular agent. The ancient Regia of Ptolemy, Limerick, from its position on the Shannon, was long an object of desire to the Danes, who occupied it in the middle of the ninth century and held possession till reduced to a contributary condition by Brian Boroimhe in the tenth century. It was early occupied by the English, and in 1210 King John visited and fortified it. It was assaulted and partially burned in 1314 by Edward Bruce. It was occupied by the Roman Catholic party in 1641, but surrendered to Ireton in 1651. At the Revolution it was the last stronghold of King James. Having been unsuccessfully besieged by William after the victory of the Boyne, it was regularly invested in 1691 by General Ginkel, and after a vigorous and brilliant defense of several weeks an armistice was proposed, which led to the well-known Treaty of Limerick, the alleged violation of which has been the subject of frequent and acrimonious controversy between political parties in Ireland. The so-called "treaty stone" still marks the spot, near Thomond Bridge, at the entrance of the suburb, near Thomond Gate, where this treaty was signed. Pop., 1901, 38,151; 1911, 38,518. Consult Maurice Lenihan, *Limerick: Its History and Antiquities* (2d ed., Dublin, 1884), and John Begley, *Diocese of Limerick, Ancient and Medieval* (ib., 1906).

LIMERICK, EARL OF. See DONGAN, THOMAS.

LI'MES GERMAN'ICUS, or **LI'MES ROMA'NUS.** The name given to the elaborate fortifications built by the Romans to protect the provinces of southern Germany and Rhætia against the Germans; they extended from a point near Bona, on the Rhine, to a point near Regensburg, on the Danube, a distance of about 336 miles. The limes comprised a strong wall, with blockhouses and camps at regular intervals. An excellent idea of the limes may be obtained as the result of German excavations made on the site of one of the camps, at Saalburg, near Homburg. Emperor William II took a deep interest in the excavations here and caused the camp to be completely restored. A model of the restored camp was exhibited at the St. Louis Exposition (1904) and subsequently purchased by a citizen of St. Louis and presented to Washington University there. Consult, for a description of the limes and of the restored camp at Saalburg, F. W. Shipley, in *The Classical Weekly*, vol. ii (New York, 1908–09); also H. F. Pelham, *Essays on Roman History* (Oxford, 1911).

LIME'STONE. The name given to rocks which are composed of lime carbonate. They may contain variable amounts of carbonate of magnesia and by an increase of the latter grade into dolomite. Silica, alumina, and ferric oxide are likewise present in variable amounts, and by an increase of these transitions into sandstone or shale are seen. Phosphate of lime is present in some, occasionally in considerable amounts, and carbonaceous matter, at least in small quantities, is often detected. Silicate minerals occur only in those limestones that have been changed by contact or regional metamorphism.

The variable composition of limestone is brought out by the following analyses:

	1	2	3	4	5	6	7
SiO_2...	0.54	0.06	3.83	7.60	6.22	28.72	15.37
Al_2O_3..	0.42	0.80	2.31	0.75	1.70	12.28	9.13
Fe_2O_3..					0.86	5.22	2.25
CaO ..	54.73	55.00	52.16	50.05	47.86	25.54	25.50
MgO..	0.19	....	0.14	0.30	0.04	1.10	12.35
CO_2...	43.22	43.22	41.64	41.30	42.11	24.40	34.20

1, nearly pure limestone, Ilasco, Mo.; 2, bog lime, Newaygo, Mich.; 3, chalk, Yankton, S. Dak.; 4, hydraulic limestone, Malain, France; 5, impure bog lime, Montezuma, N. Y.; 6, natural cement rock, Cumberland, Md.; 7, magnesian clayey limestone, Rondout, N. Y.

Properties of Limestone. Limestones vary in hardness from soft white powdery materials (bog lime) through those of medium hardness to others of great hardness and density. They are usually crystalline, but not always visibly so, this texture being best seen in the metamorphosed ones. Some are oölitic, and others are made up wholly or in part of shell and coral fragments.

Pure limestone is white, but the presence of even small amounts of carbonaceous matter may color it black, gray, or blue, and iron will tinge it brown, yellow, or red. The texture varies from coarse to fine; the layers range from massive to shaly. Limestone effervesces readily with cold hydrochloric acid unless it is magnesian, when only warm acid attacks it. Most limestones are easily soluble in water containing a slight quantity of carbonic or other acids, and hence their surface is sometimes quite uneven. The easy solubility of the rock has led to the formation of caves and sink holes.

Distribution. Limestones show a wide geological distribution, being found in every system, but their greatest development is among the Paleozoic formations, where a series of calcareous beds may sometimes attain a thickness of several hundred feet. The older limestones geologically are commonly crystalline, due to regional metamorphism, but the later ones may at times be so either from this same cause or from contact metamorphism. The geographic distribution of limestones is equally great.

Origin. Limestone may be formed in several ways: 1. By the accumulation of organic remains or the growth of colonies with calcareous skeletons; the former manner of origin is illustrated when shell fragments and foraminiferal cases collect on the ocean bottom, and the latter is shown in the growth of coral reefs. These fragments are often visible in unaltered limestones, but metamorphism and recrystallization tend to destroy them. Hence we rarely find fossils in marbles. Some of the chert or flint found in limestones is due to silica-secreting organisms. 2. By chemical precipitation. Many spring waters hold lime in solution in the form of bicarbonate, but this compound on coming in contact with the air is broken up and lime carbonate precipitated. The same change is also caused by certain minute algæ and other plants found growing in ponds. The effect of plant action is seen in the accumulation of boglime in the bottom of many ponds. The lime carbonate deposited by springs often forms beautiful incrustations on mosses and other objects. 3. By mechanical means. Calcareous rocks are broken down by wave action, and the fragments strewn over the ocean bottom in time may form extensive strata. The high percentage of magnesium carbonate found in some limestones may be due to secondary changes, and the alteration of limestone to dolomite may be accompanied by a decrease in volume.

Limestones are found in many States, but are especially abundant east of the Mississippi, underlying large areas in the Eastern and Central States. An important group known as the Shenandoah follows the Great Valley from New York to Alabama, while in the Central States extensive deposits occur in the Mississippian or lower Carboniferous.

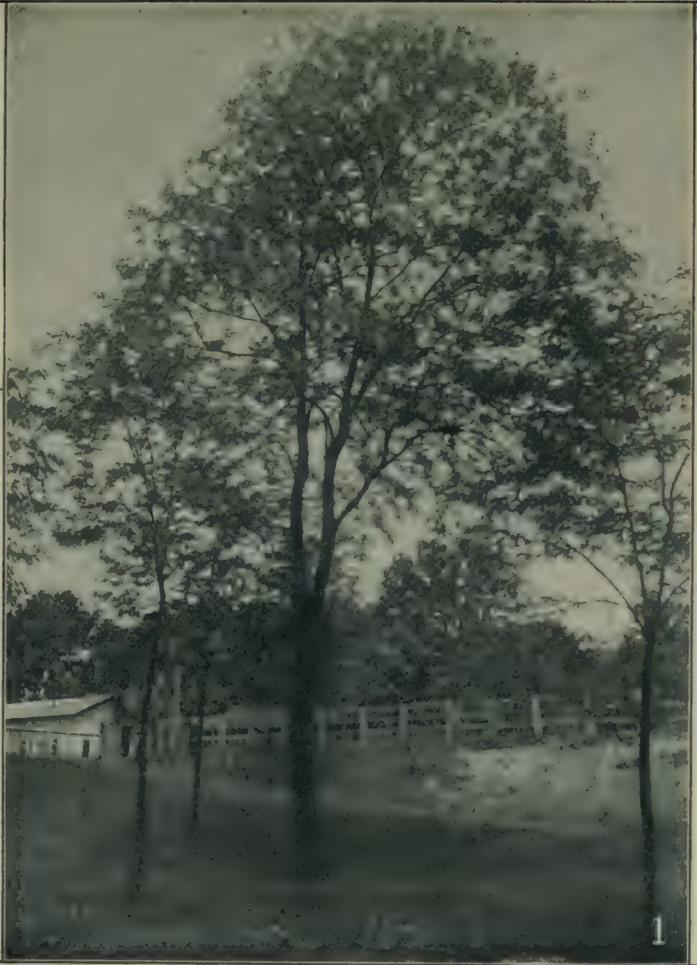
Varieties of Limestone. A number of names have been given to different varieties of limestone, of which the more important are the following: *Bog lime*, a soft, calcareous mud, formed in the bottom of many ponds. *Crinoidal limestone*, a variety containing fragments of crinoid stems. *Coquina* (q.v.), a variety composed of loosely cemented shell fragments, common in Florida. *Chalk* (q.v.), a white variety of limestone, formed chiefly of foraminiferal shells. It is known in some of the Western States, but the best-known formations are those of southern England, France, and Denmark. *Dolomite* (q.v.), a limestone containing both carbonate of lime and magnesia. *Hydraulic limestone*, an aluminous variety having the property of hardening under water after it has been burned. *Lithographic limestone*, a fine-grained limestone used for lithographic work. *Marl* (q.v.), a calcareous clay. *Marble* (q.v.), strictly speaking, is a crystalline metamorphic limestone, but the term has been expanded in commercial use to include any limestone that will take a polish. *Oölite* (q.v.), a limestone composed of small spherical grains. *Saccharoidal limestone*, a coarsely granular variety. *Travertine* or *calcareous tufa*, calcareous deposits formed around the mouths of springs. Extensive deposits occur near Tivoli, Italy.

Uses. The chief use of limestone is for building purposes, for which it is found especially valuable on account of its wide distribution, dense structure, and massive character. Marble is used for both structural and decorative work. Limestone is also widely used as a road material. Limestones are extensively used in their calcined form. A limestone free from clay will, when heated to about 800° C., yield lime (q.v.), which slakes when mixed with water, but whose several properties vary with the amount of magnesia present. If the rock contains an appreciable quantity of clayey impurities, then after calcination to the proper temperature it no longer slakes, but will, if finely ground, form a hard mass or set, when mixed with water. This product is known as hydraulic cement. Natural-rock cement, such as the Rosendale or Louisville type, is made by calcining a clayey limestone, which may be high or low in magnesia. Limestone low in magnesia, when mixed with the proper amount of shale or clay and burned at a high heat, forms Portland cement. Other uses of limestone are as a flux in iron and lead smelting and in glass manufacture. When burned to lime, it is employed for making mortar and chloride of lime, and is used in gas, soap, and sugar manufacture, as a disinfectant, for bleaching, in the manufacture of Bessemer steel, etc. The total value of the limestone produced in the United States in 1913 and used chiefly for structural and road material was $38,745,429. Of this amount $11,103,989 represented the value of stone sold for lime for blasting-furnace flux, and $387,724 for sugar factories. Much of the limestone quarried is now ground and sold for agricultural purposes, and this formed $493,718 of the total production.

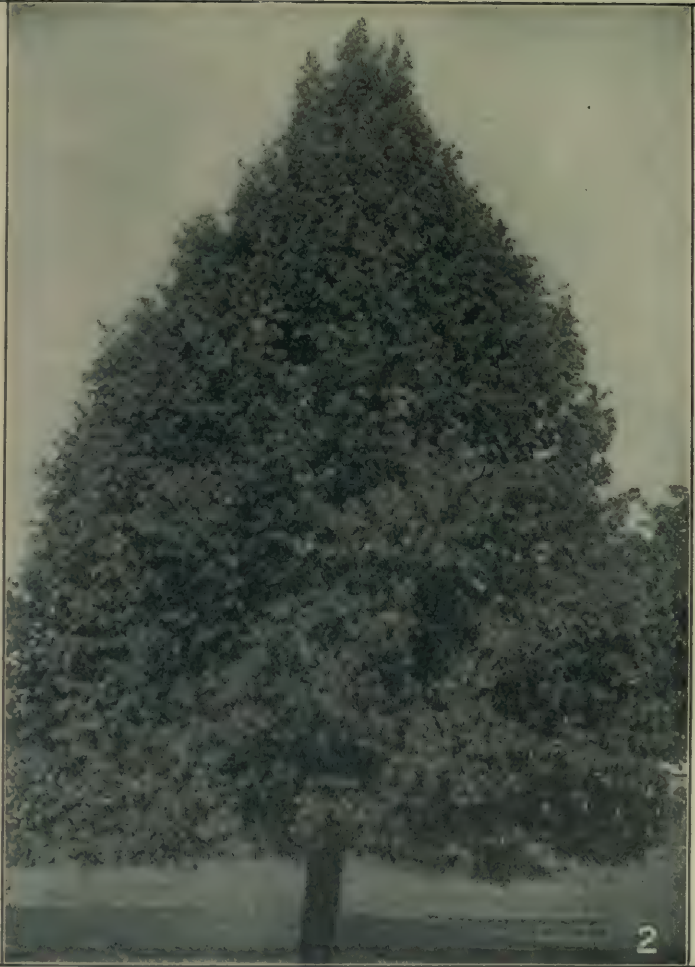
Bibliography. T. C. Hopkins, "Marbles and Other Limestones," in *Arkansas Geological Survey, Report*, vol. iv (Little Rock, 1893); Heinrich Ries, "Limestone Quarries of Eastern New York, Western Vermont, Massachusetts, and Connecticut," in *United States Geological Survey, Report* (Washington, 1896); A. C. Lane, "Michigan Limestones and their Uses," in *Engineering and Mining Journal* (New York, 1900); Heinrich Ries, "Limestones of New York and their Economic Value," in *Annual Report of the New York State Geologist* (Albany, 1900); E. C. Eckel, *Cements, Limes, and Plasters* (New York, 1907); W. G. Renwick, *Marble and Marble Working* (London, 1909); Eckel and others, "Portland and Cement Materials in the United States," in *United States Geological Survey, Bulletin No. 522* (Washington, 1913); Ries and Watson, *Engineering Geology* (New York, 1914). See BUILDING STONE; MARBLE; CEMENT; LIME; MARL.

LIME TREE, LINDEN, LINN or BASSWOOD (AS. *linden*, from *lind*, *linde*, Icel. *lind*, OHG. *linta*, Ger. *Linde*, linden; probably connected with Gk. *ἐλάτη*, *elatē*, silver fir). A name given to trees of the genus *Tilia*, of the family Tiliaceæ, natives of Europe, the north of Asia, and North America. The species, which number about a dozen, are very similar—graceful, umbrageous trees, with deciduous heart-shaped, serrated leaves, and cymes or panicles of rather small yellowish flowers, each cyme or panicle accompanied with a large, oblong, yellowish, membranous bract with netted veins, the flower part of which adheres to the flower stalk. The wood is light and soft, tough, durable, and particularly suitable for carved work, and is much used by turners. The charcoal made of it is often used for tooth powder, for medicinal purposes, for crayons, and for the manufacture of gunpowder. The fibrous inner bark is used for making ropes, mats, and other plaited work. It is also used as a healing application to wounds and sores, being very mucilaginous, and containing a bland sap. The flowers have an agreeable odor, and abound in nectar much sought after by bees. The celebrated nectar, much valued for medicinal use and for making liqueurs, is the product of great lime forests near Kovno in Lithuania. The seeds contain a fixed sweet oil. The European lime or linden (*Tilia cordata* and *Tilia platyphyllos*) often attains a large size, particularly in rich alluvial soils. Some botanists distinguish a small-leaved kind (*Tilia parvifolia*) and a large-leaved (*Tilia grandifolia*) as different species; others regard them as mere varieties. The hooded or capuchin lime is an interesting mountainous variety. The lime tree

LOCUST AND LINDEN

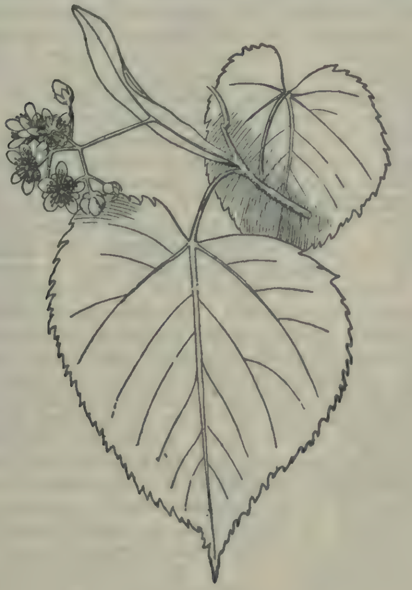


1. LOCUST



2. LINDEN

is often planted for shade in towns; and the principal street of Berlin is called *Unter den Linden*, from the rows of lime trees which line it. The American lime (*Tilia americana*), commonly called whitewood or basswood in America, has larger leaves than the European species. It is found from New Brunswick to Virginia, and in the elevated parts of Alabama and Georgia, westward to Minnesota and Texas. It reaches a height of 80 feet or more and 4 feet in diameter. The wood is fine, close-grained and soft, easily worked, and is extensively used for furniture, carriage boxes, turning, etc. The tree is considered especially valuable for street planting, as it is hardy, resists drought, and is less liable to injury than many others. A similar species is the white basswood (*Tilia heterophylla*), which occurs from Pennsylvania to Florida and westward through Indiana and Illinois to Texas. It is similar to the above in its properties and characteristics. The species of basswood have been tried for paper pulp, but the quality furnished was considered inferior to that obtained from spruce.



LINDEN.

LIMFJORD, lĭm′fyôrd. A narrow passage extending from the Cattegat to the North Sea and cutting off the northern part of Jutland from the mainland (Map: Denmark, B 2).

LIMIC′OLÆ (Neo-Lat., from Lat. *limus*, mud + *colere*, to inhabit). A large order of birds, also called Charadriiformes, and in common parlance the plover-snipe group, differing from other wading birds chiefly in their breeding habits. They lay few eggs, usually four, and the young when hatched are at once able to run about and look out for themselves. The body is rounded or depressed, never notably compressed, as in the rails. The members of most species are of small size, and are usually found in open places near bodies of water. They feed on insects and worms and other small animals, for the capture of which their long, slender, and sensitive bills are admirably fitted. The order is a large one and includes about a dozen families found in all parts of the world. The best known of these and the most typical are the plovers (Charadriidæ), the snipes, sandpipers, curlews, etc. (Scolopacidæ), and the avocets (Recurvirostridæ). The other families are the pratincoles (Glareolidæ), confined to the Old World; the thick-knees (Œdicnemidæ), with eight species, all but one of which are Old World forms; the jaçanas (Parridæ), rail-like birds of both hemispheres; the sheathbills (Chionidæ), remarkable pure white birds of Kerguelen and the Crozet Islands, two species of which are known; the Thinocoridæ, a family of half a dozen gallina-like South American birds; the crab plovers (Dromadidæ), only one species being known, an inhabitant of India and Africa; the Hæmatopodidæ or oyster-catchers, with six or eight cosmopolitan species; the Phalaropodidæ, with three boreal species, easily recognized by their lobate feet; and lastly and doubtfully the Old World bustards (Otididæ), which are perhaps more nearly related to the cranes. See Plates of BEACH BIRDS, and of SHORE BIRDS.

LIMITATION. See LIMITATION OF ESTATES.

LIMITATION, CONDITIONAL. See CONDITIONAL LIMITATION.

LIMITATION OF ACTIONS (Lat. *limitatio*, a bounding, from *limitare*, to bound, from Lat. *limes*, boundary; connected with *limen*, threshold). The limitation by law of the time allowed to a party in which to commence an action after his cause of action has accrued. Owing to the difficulty of preserving evidence for long periods of time, and to prevent the disturbance of rights which have been long enjoyed and acquiesced in, sound policy requires that some limit should be placed upon the time within which actions may be brought. Equity, recognizing the justice of such a doctrine, early refused relief to a plaintiff when guilty of long and inexcusable delay in asserting an alleged right (see LACHES), but the limitation of actions at law is purely statutory. Statutes of limitation were enacted in the time of Edward I and Henry VIII, and these were revised by the Statute of Limitation passed in the twenty-first year of James I (1624), which, with slight modification, has been reënacted in most of the States of the United States.

The following are the more important periods of limitation which, with some variation, have been adopted in England and the United States. Actions affecting the title to real estate, or founded upon a contract under seal, must be brought within 20 years. Similar actions affecting the title to personal property, and actions founded upon contracts not under seal, within six years, and those founded upon personal tort, within two years. In many States the time for bringing equitable actions is limited to 10 years; and in most States there are short periods of limitation for actions against administrators and executors.

An action is deemed to be begun for the purpose of avoiding the statutory limitation by the delivery of the writ or summons to the sheriff or other proper officer for service. The action is not then barred by the statute even though service of process is not made until after the expiration of the statutory period. A person under a legal disability (as infancy, insanity, or, formerly, coverture or absence from the jurisdiction) is not barred from his action by any lapse of time so long as the disability continues, but is allowed additional time, sometimes the full period of limitation, sometimes a shorter period fixed by the statute, after the disability has come to an end, in which to assert his right to relief.

The period of limitation runs from the time that the cause of action accrues. In the case of actions founded on the right to possession of property, whether real or personal, the cause of action accrues with the adverse possession of the property. In the case of both real and personal property uninterrupted adverse possession for the statutory period in effect vests the party in possession with a perfect title, as the real owner is barred from bringing an action.

In the case of land possession must be of definitely bounded or ascertained property and it must in any case be against the consent of the owner. The possession of a tenant or of a mortgagor, being with the consent of the owner and the mortgagee respectively, is not adverse, and is not affected by the statute.

In the case of actions founded upon contract the statute runs from the time when the defendant is bound to perform the contract. Thus in case of negotiable paper the statute begins to run when the paper becomes due. In case of open or running accounts the statute runs from the date of the last item of the account. In the case of obligations to pay money a payment of interest or of a part of the principal forms a new due date from which the statute begins to run anew, and a promise made by the debtor or obligor after the expiration of the statutory period revives the debt or obligation.

In the case of torts the right of action accrues and the statute runs from the time when the tortious act takes effect or results in the injury complained of.

In most jurisdictions the defense of the Statute of Limitations is not available to the party entitled to avail himself of it unless set up by him as a defense and generally the burden of proof is upon him to make good the plea. Consult: Wood, *A Treatise on the Limitation of Actions* (Boston, 1901). See Pleading.

LIMITATION OF ARMAMENT. See Supplement.

LIMITATION OF ESTATES. In the common law of real property, the fixing of the quality or quantum of a freehold estate by the terms of the conveyance by which it is created. Inasmuch as the nature of an estate conveyed resulted from the use of appropriate terms of limitation, the phrase came to be employed in the more general sense of a conveyance, and accordingly an estate for life or in fee (but never an estate for years) was said to be limited, i.e., conveyed or granted to or vested in a person. An estate is limited to a person in fee if the conveyance contains words of inheritance, as to John Doe and his heirs (fee simple), or to John Doe and the heirs of his body (fee tail), and for life if it lacks words of inheritance, or, generally in modern law, if it contains the words "for life." The term has, however, gone out of common use except where an estate is limited to come to an end upon some future event other than that (the death of a life tenant, the failure of heirs of a tenant in fee, etc.) which would naturally determine it, as where lands are given to A and his heirs so long as the property shall be used for a specific purpose. Such a conveyance creates what is known as an estate on collateral limitation, the proviso or limitation which may determine it being collateral to the estate created, which is a fee simple naturally terminable only by the failure of heirs of the person last seised. So a devise of lands to a widow so long as she shall remain unmarried creates a life estate on collateral limitation, i.e., one which will naturally endure so long as she lives but which will ipso facto be determined in the event of her marriage. Such estates are also known as estates on conditional limitation. Some recent authorities, however, employ the latter expression in a distinctive sense to describe the future estate which accrues to a person on the shifting of a fee from a previous holder, as where lands are given to A in fee but with the proviso that if he die without issue surviving the estate shall go to B. In this case B is said to acquire an estate on conditional limitation. See Estate; Fee; Reverter, Possibility of; and authorities referred to under Real Estate; Property.

LIMITED COMPANY. A company whose liability is limited to the amount of its capital, and whose stockholders are exempt from liability beyond the amount which they have invested in the company as represented by the stock held by them respectively. In this respect limited companies partake of the nature of corporations. The term is most frequently applied to joint-stock companies limited, which are organized under modern statutes, or to limited partnership associations, also creations of modern legislation. See Joint-Stock Company; Partnership; Corporation; and authorities there cited.

LIMITED LIABILITY. Pecuniary liability limited to the amount which a person has invested in a joint-stock or other enterprise. At common law, this could be secured only by a special contract; i.e., by one to which both parties expressly assented. If an insurance or banking partnership wished to limit its liabilities to its assets, and save its members from personal responsibility for its debts, it was bound to notify the insured, or the bank depositor or holder of bank bills, as the case might be, that it would contract with him only on that basis. Under modern statutes, however, authorizing the formation of joint-stock companies (see Joint-Stock Company) and limited partnerships (see Partnership), the term "limited liability" is imported into all contracts made with such associations. Persons dealing with them are bound to take notice of the privilege so accorded to them; but as this privilege is statutory, it avails only those who have complied with the legislative requirements. Thus, if a limited company in England omits the word "limited" from its name, its shareholders are bound to pay its debts in full.

By the general maritime law (q.v.) of Europe, a shipowner can absolve himself from liability for the negligence of the master or crew by surrendering the ship and the freight. This rule has been adopted by Parliament in England and by the Congress of the United States. (See 7 Geo. II, c. 15.) Its present provisions are found in the Merchant Shipping Act, 1894 (57 and 58 Vict., c. 60), as amended by various acts, especially by Merchant Shipping Act, 1900 (63 and 64 Vict., c. 32). Congressional legislation on this topic began in 1851, and is now embodied in the United States Revised Statutes, §§ 4282 to 4289, as amended. Under it "the owner of any vessel, whether steamer or canal boat, employed whether in seagoing or inland navigation, whether he be an American citizen or a foreigner, may obtain a limitation to the value of his interest in the vessel and her pending freight, of his liability not only for the results of a single disaster, but for the results of a disastrous voyage, including all debts due on account of the vessel save seamen's wages." These statutory provisions apply to liability for personal injury and death, as well as for damage to property. If the ship and freight are lost, the owner must abandon to the injured parties all claims and causes of action having reference to the vessel and freight. If he collects these he is liable to the injured parties to the extent of the proceeds.

It is to be noticed that this limitation of liability is confined to the owners of the vessels who are not in charge thereof. The master and seamen whose misconduct causes the injuries are not exempted from liability by maritime law or by statute. Consult E. C. Benedict, *The American Admiralty, its Jurisdiction and Practice* (New York, 1898).

LIMITED PARTNERSHIP. See LIMITED LIABILITY; PARTNERSHIP; SOCIÉTÉ EN COMMANDITE.

LIMITS, THEORY OF. When the difference between a variable and a constant quantity may become and remain less in absolute value than any assignable quantity, however small, the constant is called the *limit* of the variable; e.g., the sum of two, three, four, . . . n terms of the series $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\ldots$ is a variable which, by taking n sufficiently large, may be made to differ from 1 by less than any assignable quantity. The variable may be always less than, always greater than, or sometimes greater and sometimes less than, its limit. The series $1-\frac{1}{2}+\frac{1}{4}-\frac{1}{8}+\ldots$ is an example of the last, since the limit is $\frac{2}{3}$, while the sums to one, two, three, etc., terms are $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$, etc. The symbol $\doteq$ is used to indicate that a variable approaches a constant as a limit; e.g., $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots\doteq 1$. In algebra the limit of a given function $f(x)$ when $x \doteq a$ is defined thus: If for any positive value e, however small, a number α can be found such that for all values of x satisfying the inequality $|x-a|<\alpha$ the corresponding values of $f(x)$ satisfy the inequality $|f(x)-b|<e$, then b is called the limit of $f(x)$. E.g., let $f(x)=x^3$, and suppose $x\doteq 0$; select e as 0.001; then (1) $|x-0|<\alpha$ (2) $|x^3-0|<0.001$, show that for $\alpha=0.1$ any value of x satisfying (1) gives an x^3 satisfying (2), therefore, by making e small enough, $x^3\doteq 0$ as $x\doteq 0$. (The notation $|x|$ stands for the *absolute value* of x.)

The fundamental propositions of limits are: 1. If two variables are always equal or in a constant ratio as they approach their limits, their limits are equal or are in the same ratio. 2. The limits of the algebraic sum of a finite number of variables is the sum of their limits. 3. The limit of the product of a finite number of variables is the product of their limits, all the quantities being finite. 4. The limit of the quotient of two variables is the quotient of the limits, if the expression does not assume the form $\frac{0}{0}$ or $\frac{\infty}{\infty}$. In case an expression of the form $\frac{f(x)}{\phi(x)}$ becomes $\frac{0}{0}$ or $\frac{\infty}{\infty}$ for a particular value $x=a$ of the variable, the true value is easily found by a rule due to L'Hôpital, which consists in replacing $f(x)$ and $\phi(x)$ by their derivatives, and, if necessary again, by their second derivatives, and so on. For exceptions to this rule and its applications, consult the works mentioned under CALCULUS. See also FRACTION.

The theory of limits is among the most important in mathematics, the rigor of modern analysis depending upon the high state of perfection of this theory. The mensuration of curves and surfaces, the treatment of series (q.v.), and the foundations of calculus (q.v.) rest upon it. The modern method of limits is a development of Newton's theory of prime and ultimate ratios found in the *Principia* (1687).

The *limits of the roots* of an equation are the numbers above and below which it is impossible that the roots should exist. The approximate solution of numerical higher equations consists in bringing the limits of each root as nearly together as possible.

For historical and theoretical discussion, consult Alfred Pringsheim, in the *Encyklopädie der mathematischen Wissenschaften,* vol. i (Leipzig, 1898).

LIM′MA (Lat., from Gk. λεῖμμα, *leimma,* remnant, from λείπειν, *leipein,* to leave). An interval in the musical system of the ancient Greeks which to-day is designated as a *diatonic* semitone (a—b♭), as opposed to the chromatic semitone (a—a♯), which latter the Greeks called *apotome.* In our modern system the diatonic semitone is larger than the chromatic, but with the Greeks it was the reverse. They determined the limma by subtracting two whole tones, each in the proportion of 8 : 9, from the perfect fourth (3 : 4) and thus established the ratio 243 : 256; whereas the apotome or chromatic semitone was fixed in the proportion of 2048 : 2187. See APOTOME.

LIMNÆ′A. See POND SNAIL.

LIMNANDER DE NIEUWENHOVE, lĭm′nän-dẽr dė nē′ven-hō′ve, ARMAND MARIE GUISLAIN, BARON (1814–92). A Belgian composer, born at Ghent. He was educated at the St. Acheul Jesuits' College, near Amiens, afterward at Fribourg, and later studied composition with Fétis. Upon his return to Belgium from Switzerland he began the work of composition, and also conducted an amateur symphonic society at Mechlin. In connection with this he founded a choral society, the Réunion Lyrique, and he wrote some fine choruses for unaccompanied male voices, besides a *Requiem Mass,* with organ; a *Stabat Mater,* with orchestra; a sonata for piano and violoncello; *Les Druides,* operatic scenes, produced at the Paris Conservatory (1845); a symphony called *La fin des moissons;* a *Te Deum;* and some cantatas. In 1847 he removed to Paris, where his comic opera *Les Monténégrins* was presented at the Opéra Comique (1849), followed by *Le château de la barbe bleue* (1851) and *Yvonne* (1859), while his *Maître-chanteur* was given at the Opéra (1853) and again in Brussels (1870) under the title *Maximilien.*

LIMNAN′THEMUM. A genus of plants. See VILLARSIA.

LIMNO′RIA. See GRIBBLE.

LIMOGES, lē′mŏzh′. An episcopal city, the capital of the Department of Haute-Vienne, France, and the ancient capital of Limousin (q.v.), situated on the right bank of the Vienne, 215 miles south-southwest of Paris (Map: France, S., F 3). It is a very old town, with narrow, crooked streets in the older quarters and many buildings and monuments attesting its antiquity. The newer portions were built up after the demolition of the old fortifications. The most notable building is the cathedral of St. Etienne, begun in 1273 on the site of an older church and completed only in 1890. The interior is decorated in Renaissance style and contains a delicately ornamented rood loft of the sixteenth century and tombs of the former bishops of Limoges. There are two other churches dating respectively from the thirteenth and fifteenth centuries and the eighteenth-century bishop's palace with fine gardens. The town hall is a modern Renaissance building (1878–81) and has a collection of paintings and sculptures. Limoges has some Roman remains and a number of private houses dating from the Middle Ages. The educational institutions of the town consist of a lycée, a theological seminary, preparatory schools of medicine and pharmacy, a national school of decorative arts, a commercial and industrial school, a library of 85,000 volumes in 1913, a museum of ancient pottery, and a meteorological observatory. Every seven years it celebrates the Fête d'Ostension to commemorate the destruction in the tenth century of 40,000 persons by the plague. Limoges has since ancient times been known for its artistic industries. In the Middle Ages it was celebrated for its mint and gold ware and later for its enamels. In 1736 the porcelain industry was introduced, and, favored by the discovery of fine clays in the vicinity, it developed very rapidly. It is now one of the chief centres of the porcelain industry in Europe. About 8000 men are employed in the porcelain factories of the town, and considerable quantities of kaolin are exported to other European countries and even America. A printing establishment was founded at Limoges as early as 1496 and the printing of books is among the chief industries of the town. Other prominent industries of Limoges are distilling, brewing, tanning, and the manufacture of shoes and clogs, nails, knives, hats, gloves, paper, and machinery. The textile industry, once extensive, is now in a state of decline. Limoges is advantageously situated for commercial purposes, and carries on a considerable trade between Paris and the south of France. It is the headquarters of the Twelfth Army Corps. Pop., 1901, 77,862; 1911, 92,181. At the Roman conquest Limoges was the capital of the Gallic tribe Lemovices, and a place of considerable strength and importance. It suffered greatly from the Vandals and during the Hundred Years' War, as well as from frequent conflagrations. Christianity was introduced in the third century by St. Martial, the first Bishop of Limoges. In 1630–31 the town was ravaged by a terrible pestilence, in which over 20,000 people perished.

LIMON, lē-mōn′. The principal seaport of Costa Rica, situated on the eastern (Caribbean) coast, at the eastern terminus of the interoceanic railroad to Puntarenas (Map: Central America, F 6). It has a good harbor, well provided with wharfage facilities, is regularly visited by five lines of steamers going to American and European ports, and is the seat of a United States Consul. It exports most of the coffee produced in Costa Rica, besides tropical fruits, rubber, and dyewoods. Pop., 6539.

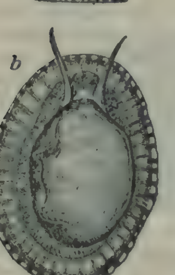
LI′MONITE (from Gk. λειμών, *leimōn*, marshy, meadow), or Brown Hematite. The hydrated sesquioxide of iron ($2Fe_2O_3 3H_2O$), containing 59.89 per cent of metal. When pure or nearly so, it occurs in compact masses with a silky or submetallic lustre, brown or brownish yellow in color, and a hardness of 5–5.5 on the mineral scale; but when mixed with clay, as it often is, it is found in the form of a loose ochreous earth, colored various shades of yellow or brown. The limonite of commerce may contain other hydrous iron oxides such as goethite and turgite, therefore the term *brown ore*, which would include all these, is a better one. Limonite is a commercial source of iron, but by no means the most important one. It may be found in several different forms as follows: 1. Bog ore, found in lakes and swamps, due to the precipitation of iron in the hydroxide form from spring and pond waters. This is of no commercial importance in the United States, but was worked formerly to some extent in Canada. In some countries, notably Sweden, the bog ore accumulates to a thickness of half a meter in from 15 to 30 years. 2. Gossan ore, a porous mass of hydrous iron oxide, formed by the weathering of deposits of sulphides of iron, or sometimes iron and copper. A few deposits have been worked in the Eastern States. They are common in the West, and may carry gold, silver, or even manganese. 3. Residual deposits, in which the ore forms lumps and masses scattered through residual clay. These are often associated with Cambro-Silurian formations in a belt from Vermont to Alabama, and are worked chiefly in Alabama and Virginia. 4. Replacement deposits, the ore replacing limestones and sandstones. These are best known in Virginia. The limonite is not a high-grade ore of iron, and often carries much clay and silica. The residual material is prepared for market by a washing process. The merchantable ore contains 40 to 50 per cent iron. The production of brown ore in the United States in 1913 amounted to 1,577,019 long tons.

Bibliography. Pechin, "Virginia Oriskany Iron Ores," in *Engineering and Mining Journal*, vol. liv (New York, 1892); R. A. F. Penrose, "The Chemical Relation of Iron and Manganese in Sedimentary Rocks," in *Journal of Geology*, vol. i (Chicago, 1893); Henry McCalley, "The Limonites of Alabama Geologically Considered," in *Engineering and Mining Journal*, vol. lxii (New York, 1896); T. C. Hopkins, "Limonite Ores of Pennsylvania," in *Bulletin Geological Society of America*, vol. xi (Rochester, 1900); T. L. Watson, *Mineral Resources of Virginia* (Lynchburg, 1907); Heinrich Ries, *Economic Geology* (3d ed., New York, 1910). See Iron; Bog Iron Ore; Ochre; Mineral Paints.

LIMOUSIN, lē′mōō′zăɴ′. An ancient province of France, now comprised in the departments of Haute-Vienne, Creuse, and Corrèze (q.v.) (Map: France, S., F 3). The land of the ancient Lemovices, it was part of the dowry of Eleanor of Aquitaine when she married Henry II of England in 1152. In the thirteenth century it passed to Brittany and subsequently to the house of Albret and was united with the French crown by Henry IV. The capital was Limoges.

LIMOUSIN, or **LIMOSIN**, lē′mō′zăɴ′, Léonard (active, 1535–74). A French enamel painter. Nothing is known positively concerning his birth and training, but he was born probably at Limoges and studied with Nardon Penicaud; he was influenced also by the German school and the Italian masters of Fontainebleau. He was appointed valet de chambre (practically court painter) to Francis I and Henry II of France, for whom he executed many portraits in enamel, besides other decorative works, such as vases, plaques, goblets, medals, dated from 1535 to 1574. Of his recorded output of 2000 enamels many fine examples survive in the Louvre, including two votive tablets (each of 23 plaques) for the Sainte Chapelle (1523). Although he occasionally worked in translucent enamels, he usually preferred a few opaque colors, generally using dark blue or green as backgrounds for his portraits, which are particularly celebrated and rival Clouet's portrait heads. Among those in the Louvre are several of Diane de Poitiers, one showing her mounted behind Henry II on a white horse. The Morgan collection, Metropolitan Museum, New York, also contains some excellent specimens, including Francis I and Margaret of Navarre and a small unknown portrait dated 1546. Other members of his family, known as workers in enamel, lived in Limoges, which was famed for this especial kind of art for several centuries. Consult the monographs by Boudery (Limoges, 1895), and Boudery and Lachenaud (Paris, 1897).

LIM′PET (probably from AS. *lempedu*, variant of *lamprede*, lamprey, from ML. *lampreda*, lamprey, from Lat. *lambere*, to lick + *petra*, rock; hardly connected with Lat. *lepas*, Gk. λεπάς, limpet, from λέπας, bare rock, from λέπειν, *lepein*, to strip, to peel). A gastropod mollusk of the prosobranchiate family Patellidæ, in which the shell is nearly conical, not spiral, and with a wide mouth and the apex turned forward. The animal has a large round or oval muscular foot by which it adheres to rocks, the power of creating a vacuum being aided by a viscous secretion. Limpets live on rocky coasts, between tidemarks, and remain fixed when the tide is out, as their fringed gills cannot bear exposure to the air, but move about when the water covers them; many of them, however, it would seem, remain long on the same spot, which in soft calcareous rocks is found hollowed to their exact form. The power of adherence is very great, so that, unless surprised by sudden seizure, they are not easily removed without violence sufficient to break the shell. Curious cases of the homing instinct of limpets are reported by Morgan. If removed from their station or "home" on a rock, they will find their way back, even if carried away as far as 3 feet. They feed on algæ. The sexes are distinct. The species are numerous and exhibit many varieties of form and color. The American species is *Acmæa testudinalis* and is common along the New England coast. Some of the limpets of warmer climates have very beautiful shells. A species found on the western coast of South America has a shell a foot wide which is often used as a basin. The name is often extended to other shells, especially of the related families Acmæidæ and Fissurellidæ (keyhole limpets) and the genus *Crepidula* (slipper limpets). The fresh-water snails of the genus *Ancyclus* are called fresh-water limpets, from the shape of the shell. Limpet-like shells are found fossil in rocks of all ages from the Cambrian upward, and many of the early forms cannot readily be distinguished from modern genera. The oldest is *Scenella*, a low conic shell with reticulate surface, found in the Cambrian. *Palæacmæa*, with a smooth low conic shell, is from the Upper Cambrian. The genera *Patella* and *Acmæa* occur from the Silurian upward; *Metoptoma*, with a straight anterior margin, is a common Silurian to Carboniferous fossil, and *Tryblidium*, with a thick oval flattened shell marked by strong imbricating plates, is a curious Silurian form evidently evolved from some early limpet.



A LIMPET (*Patella*).

a, outline of shell in its natural position; *b*, underside, on a larger scale, showing the broad foot, tentacles, and gill fringes of the animal.

LIMP′KIN, or COURLAN. A bird of tropical America, representing the family Aramidæ, which is intermediate in its characteristics between the rails and the cranes. Two species are known—*Aramus scolopaceus* of eastern South America, and *Aramus pictus*, or *vociferus*, of Central America, the West Indies, and southern Florida. The Spanish people of that region call it "viuda loca" (mad widow) on account of "its sombre plumage, solitary habits, and peculiar cry," which is heard at night in a melancholy wail. It is a bird of the swamps, flies heavily and awkwardly, and feeds on frogs, aquatic insects, etc. See Plate of CRANES, ETC.

LIMPO′PO, UBI, or CROCODILE. A river in the eastern part of South Africa (Map: Cape of Good Hope, J 4). It rises a little west of Pretoria in the Province of Transvaal and after a short course towards the northwest is joined by the Marico and forms from the point of junction the boundary line separating the Province of Transvaal from the Bechuanaland Protectorate and Southern Rhodesia. After it leaves British territory it flows in a southeastern course through Portuguese East Africa and enters the Indian Ocean through Delagoa Bay. Its total length is about 1000 miles. In its upper course it flows through an elevated region and forms a number of rapids, while the portion in Portuguese territory is chiefly through lowlands. The most important tributary is the Olifant. The Limpopo is navigable for about 100 miles from its mouth during all seasons and farther during flood seasons; but its mouth is obstructed by sand bars, and the river is not important for commerce.

LIMU, lē′mo͞o. A kind of edible seaweed used in Hawaii. See CARRAGEEN.

LIM′ULUS. See KING CRAB; MEROSTOMATA.

LINACRE, lĭn′ȧ-kēr, or **LYNAKER**, THOMAS (?1460–1524). An English humanist, physician, and divine, born at Canterbury. He studied at Oxford and became fellow of All Souls' College in 1484. Shortly afterward he went to Italy and devoted himself to the study of Latin, Greek, natural philosophy, and medicine under the famous teachers of the day, and translated some of Galen's treatises. Returning to England, he received the degree of D.D. and the appointment of professor of physic from Oxford University; was called to the court by Henry VII and made physician and tutor to Prince Arthur; was subsequently physician to Henry VII, Henry VIII, and Princess Mary. Later in life he gave up practice, took orders, and was made in 1509 rector of Mersham and prebend of Wells; in 1518 prebend and in 1519 precentor in York Cathedral. His most celebrated works are his Latin translations from Galen, among which are: *De Temperamentis* (1521); *De Tuenda Sanitate* (1517); *De Methodo Me-*

dendi (1519). His other works are a translation of *Proclus de Sphæra; De Emendata Structura Latini Sermonis* (1524). He was buried in St. Paul's Cathedral, where Dr. Caius erected a monument to his memory. He rendered important service in promoting the study of medicine and was instrumental in founding the College of Physicians (1518), of which he was the first president. But his main title to remembrance rests upon scholarship and his connection with Erasmus and the other learned men who fostered classical learning in England. With Grocyn and Latimer he was among the first to teach Greek at Oxford, where Erasmus and Sir Thomas More were among his pupils. Consult his *Life* by J. N. Johnson, ed. by Robert Graves (London, 1835).

LINARES, lê-nä′râs. A province of Chile, bounded by the Province of Talca on the north, the Republic of Argentina on the east, the Province of Nuble on the south, and Maule on the west. Area, 3942 square miles (Map: Chile, E 5). It is mountainous and well wooded, and has extensive tracts of grazing land. The chief occupations are stock raising and viticulture. The province is traversed through the centre by the main railway line of Chile. Pop., 1895, 101,858; 1911, 112,566. The capital of the province is Linares (q.v.).

LINARES. A capital of the province of the same name in Chile (Map: Chile, E 5). It lies on a plain, 55 miles from the Pacific coast and 85 miles northeast of Concepción. It is an important commercial centre and station on the railroad running south from Santiago. Pop., 1895, 7331; 1907, 11,122.

LINARES. A city of Spain, in the Province of Jaén, 24 miles north of Jaén, on a branch of the railroad between Córdoba and Madrid (Map: Spain, D 3). It is an important mining town, the mines in the neighborhood producing annually 80,000 tons of argentiferous lead and copper ores. These mines were exploited under the Carthaginians and the Romans, but were afterward abandoned until the eighteenth century. In 1891 an elaborate plant for the extraction of the metals was built here and is considered one of the best in Europe. Besides this the town has lead and iron foundries and manufactories of powder, dynamite, and rope. Pop., 1887, 29,692; 1900, 38,245; 1910, 36,419.

LINARES, DUKES OF. FERNANDO DE NOROÑA, chamberlain of Philip IV, fifth Count of Linares, created Duke of Linares, was succeeded (1659) by his son MIGUEL, second Duke, who in turn was succeeded by his brother JOSÉ ANTONIO, third Duke. The latter's successor, his sister JUANA, fourth Duchess, married the Duke of Abrantes and united these two ducal titles.

LINARES, JOSÉ MARÍA (1810–61). A Bolivian statesman, born in Potosí. He studied law and after his admission to the bar began to take an active part in public life, becoming a member of the commission appointed to codify the laws of Bolivia. In 1839 he was made Minister of the Interior, and he was afterward Minister to Spain, where he negotiated the treaty whereby Spain recognized the independence of Bolivia. In 1848 he was President of the Senate and in 1857 was elected to the presidency of the republic. He endeavored to carry out a policy of reform and economy, but was prevented from so doing by a revolution which drove him from power.

L'INCARNATION, läɴ′kär′nȧ′syôɴ′, MARIE DE. A French religieuse in America. See MARY OF THE INCARNATION.

LINCEI, lên-chā′ê, ACCADEMIA DEI. A celebrated Italian learned society, founded at Rimini in 1603 by Federigo Cesi, son of the Duke of Acqua Sparta, for the purpose of fostering the study of the physical sciences. The name *lincei*, or lynxes, is supposed to have been adopted as an expression of the members' belief in the possibility of piercing the depths of scientific truth. Though it numbered among its members such men as Galileo and Stelluti, the society languished after 1630 and gradually died away. Restored in 1745 by Giovanni Branchi, it passed once more out of existence. It was revived for a second time towards the end of the eighteenth century, but was of little real importance till the occupation of Rome by the Italian troops in 1870, when it became what it has remained to the present day, one of the principal associations in Italy for the advancement of science and scholarship. As reorganized in 1870, it is divided into a royal and a papal section.

LINCOLN, lĭŋ′kon. The capital of Lincolnshire, England, a civic county, parliamentary, and municipal borough, and episcopal see, on the Witham, 130 miles northwest of London (Map: England, F 3). It is a junction of six railroads and has extensive canal communications.

Built on the slope of a hill, which is crowned by the cathedral, the city is imposing. It is irregularly laid out and contains many interesting specimens of early architecture, such as the Roman Gate (dating from about 104 B.C., now known as the Newport Arch), the remains of the Norman castle and of the palace and stables of John of Gaunt, the famous Jews' House (one of the earliest specimens of domestic architecture extant in England), and the town hall. The cathedral, commonly called the minster, one of the finest in England, is the principal building. It is surmounted by three towers, two of which, 180 feet in height, were formerly continued by spires of 101 feet. The central tower, 53 feet square, is 300 feet high. The interior length of the cathedral is 482 feet, the width 80 feet. The finest feature of the minster is the presbytery, or Angel Choir, dating from 1255, which has been described as "one of the loveliest of human works." The famous bell called Tom of Lincoln, cast in 1610 and recast in 1834, hangs in the central tower; it is 5 tons, 8 hundredweight in weight. The style of the cathedral is chiefly early English. The old church of St. Peter-at-Gowts is remarkable for its well-preserved pre-Norman tower. Lincoln has numerous schools and benevolent institutions. Its municipal administration is noteworthy. It owns remunerative real-estate markets, a race course, water works, and gas and electric-lighting plants, and maintains a free library, technical schools, an arboretum, recreation grounds, public baths, and a sewage farm. One member is returned to the House of Commons for the city. Several iron foundries and manufactories of portable steam engines and agricultural machines, as well as large steam flour mills, are in operation here, and there is an active trade in corn and wool. Lincoln is an important livestock market, and horse and cattle fairs are annually held. It is also an important horse-racing centre. The town was called by the Romans Lindum, which, with Colonia, gives the modern name. Lincoln under the Romans was a place of some importance and also under the Saxons and Danes. It

LINCOLN CATHEDRAL

was the seat of an extensive shipping trade at the time of the Norman Conquest, the river at that time being navigable for large vessels. Pop., 1901, 48,784; 1911, 57,294. Consult: Allen, *History of Lincoln* (London, 1833); A. F. Kendrick, *Cathedral Church of Lincoln: A History and Description of its Fabric and a List of the Bishops*, in "Bell's Cathedral Series" (ib., 1898).

LINCOLN. A city and the county seat of Logan Co., Ill., 29 miles northeast of Springfield, on the Chicago and Alton and the Illinois Central railroads (Map: Illinois, F 5). It is the seat of Lincoln University (Cumberland First Presbyterian), opened in 1865 and affiliated with Milliken University, and of the State School and Colony for Feeble-Minded Children. It has also a Carnegie library, Odd Fellows Orphans Home, St. Clara's Hospital, and Deaconess Home and Hospital. In the old courthouse here Lincoln practiced as a lawyer. Among the city's industrial plants are coal mines, extensive greenhouses, flour mills, creameries, and manufactories of electric automobile signal horns, shoes, corn-cutting machinery, furniture, mattresses, caskets, etc. Lincoln was incorporated in 1854 and in 1915 adopted the commission form of government providing for one mayor and four commissioners elected quadrennially. Pop., 1900, 8962; 1910, 10,892; 1914 (U. S. est.), 11,532; 1920, 11,882. The city was named in honor of Abraham Lincoln, who assisted in laying it out.

LINCOLN. A city and the county seat of Lincoln Co., Kans., about 153 miles by rail west of Topeka, on the Saline River and on the Union Pacific Railroad (Map: Kansas, D 4). It contains a Carnegie library. The city carries on a considerable trade in grain, produce, live stock, etc., and has grain elevators and flour mills, and extensive quarries of fine limestone. It owns its water works and electric-light plant. Pop., 1900, 1262; 1910, 1508.

LINCOLN. The second city of Nebraska, State capital and the county seat of Lancaster County, 55 miles southwest of Omaha, on the Burlington Route, the Chicago, Rock Island, and Pacific, the Chicago and Northwestern, the Union Pacific, and the Missouri Pacific railroads (Map: Nebraska, H 4). The attractive city, with wide avenues and modern business blocks and homes, lies on a slightly rolling prairie. It is the seat of the University of Nebraska (see NEBRASKA, UNIVERSITY OF), Nebraska Wesleyan University (Methodist Episcopal), Cotner University (Disciples of Christ), Union College (Adventist). The State Asylum for the Insane and the State Penitentiary are located here. The noteworthy buildings include, besides those already indicated, the State capitol, built of white limestone at a cost of $500,000, United States government buildings, county courthouse, St. Elizabeth's Hospital, the Home for the Friendless, and the public library, costing $75,000, the gift of Andrew Carnegie. There are also the State, State Historical, and State University libraries.

The central position of the city and its railroad facilities make it an important distributing point for the agricultural and mechanical productions of a large area. There are numerous grain elevators, the city being the centre of an important grain and milling trade, and manufactories of gasoline engines, corsets, paint, upholstered goods, mattresses, brooms, dusters, overalls and shirts, saddles and harness, sashes and doors, flour, bricks, creamery products, etc. The commission form of government was adopted in May, 1913, and provides for a council of five members and a mayor, elected every two years. The city clerk, attorney, engineer, superintendent of the water and light department, and the library board are appointed by the council. The police judge is chosen by popular election. The water works and electric-light plant are owned and operated by the municipality. Lincoln spent in 1912 for maintenance and operation $484,103, the main items being $261,063 for education, $56,029 for the water works, $55,719 for the fire department, and $21,469 for the police department. Pop., 1870, 2441; 1890, 55,154; 1900, 40,169; 1910, 43,973; 1914, 45,643; 1920, 54,934.

In 1859 the site of Lincoln was chosen for the location of a city to be called Lancaster, but there were hardly a dozen settlers there in 1864, when the place was laid out. Three years later, the inhabitants then numbering less than 30, Lancaster was chosen as the capital of Nebraska, and its name changed to Lincoln in honor of Abraham Lincoln. It is the home of William Jennings Bryan. Consult Hayes and Cox, *History of the City of Lincoln* (Lincoln, 1889).

LINCOLN. A town in Providence Co., R. I., 3 miles northwest of Pawtucket, on the Blackstone River. Its most noteworthy feature is Lincoln Reservation, a beautiful park. The manufacture, dyeing, and bleaching of cotton cloth constitutes the chief industry. Pop., 1900, 8937; 1910, 9825.

LINCOLN, ABRAHAM (1809–65). The sixteenth President of the United States, born near Hodgenville, in Hardin Co., Ky., Feb. 12, 1809. His ancestry has been with some difficulty traced back to Samuel Lincoln, of Norwich, England, who emigrated to America and settled in Hingham, Mass., in 1638. Some of his descendants, who were Quakers, settled in Amity Township, Berks Co., Pa., and finally in Rockingham Co., Va. The Virginia Lincolns are described as "reputable and well-to-do." One of them, the President's grandfather, removed to Jefferson Co., Ky. Thomas Lincoln, Abraham's father, was a carpenter and a farmer, illiterate and thriftless; Nancy Hanks, his mother, was of humble parentage, but possessed of a keen intellect and considerable force of character. After several removals in Kentucky Thomas Lincoln went in 1816 to Spencer Co., Indiana. At the new home his wife died after two years, when Abraham was not quite eight years old, and a year later he married Mrs. Sally (Bush) Johnson, whom he had formerly courted. All Abraham's schooling combined would probably not have made up more than one year. As he grew up, however, he had a few books which he read and reread—the Bible, Shakespeare, Æsop's *Fables*, *Robinson Crusoe*, *Pilgrim's Progress*, a history of the United States, and Weems's *Washington*, and he borrowed some others from his neighbors. He seems to have been ambitious from the outset, trying hard to learn, but much influenced by the coarseness of his surroundings, from the externals of which he never got quite free. He grew to be 6 feet, 4 inches in height; marvelous tales are told of his strength, and much more credible ones of his skill at jesting, story-telling, and popularity.

When Abraham was 21, his father's migratory nature impelled him to try his fortunes in Illinois, and he settled on the north fork of the Sangamon, which empties into the Illinois.

Here the younger Lincoln helped to split rails and to clear and plant some 15 acres. In 1831, with two relatives, he took a flatboat to New Orleans, whither he had made a previous trip. Ten years later he went to New Orleans again. These trips enabled him to see something of the nature of slavery. In 1832 Lincoln was chosen captain of a company of volunteers for service in the Black Hawk War. They saw no fighting and were mustered out within five weeks, when Lincoln reënlisted as a private, serving until June 16. He then returned to Sangamon, making his abode at the little mushroom town of New Salem, and, having announced his candidacy for the State Legislature, he began electioneering vigorously. With great humor and with an energy not always confining itself to strict argument, he advocated pure Whig doctrine—a national bank, internal improvements, and a protective tariff. The follower of Clay was beaten by the Jacksonian Democrats, but he had gained experience and had spread his popularity. His next venture was as a partner in a dry-goods and grocery store at New Salem; but the concern failed, the partner fled, and Lincoln was left to settle the losses. He paid all he owed in 1849. Having no gift for trade, he now began to read law, studied hard, and made swift headway. In May, 1833, he was appointed postmaster at New Salem and is said to "have carried the post-office in his hat," for the mail came but once a week. This position he held three years; at this time, too, he was a deputy county surveyor. In 1834 Lincoln's personal property was about to be sold by the sheriff to satisfy a judgment, when a new friend, Bolin Greene, bid in the property and gave it over to him. In 1834 he was again a candidate for the Legislature and was elected, running far ahead of his ticket. He was rather an observer than an active legislator in this session.

Lincoln's first love was unhappy. While boarding with James Rutledge, in New Salem, he became enamored of Ann, his landlord's daughter, a well-reared girl of 17. She had at the time another lover, who promised marriage, but he broke his word. Lincoln and Ann Rutledge were betrothed in 1835, but the girl fell ill, and in August she died of brain fever.

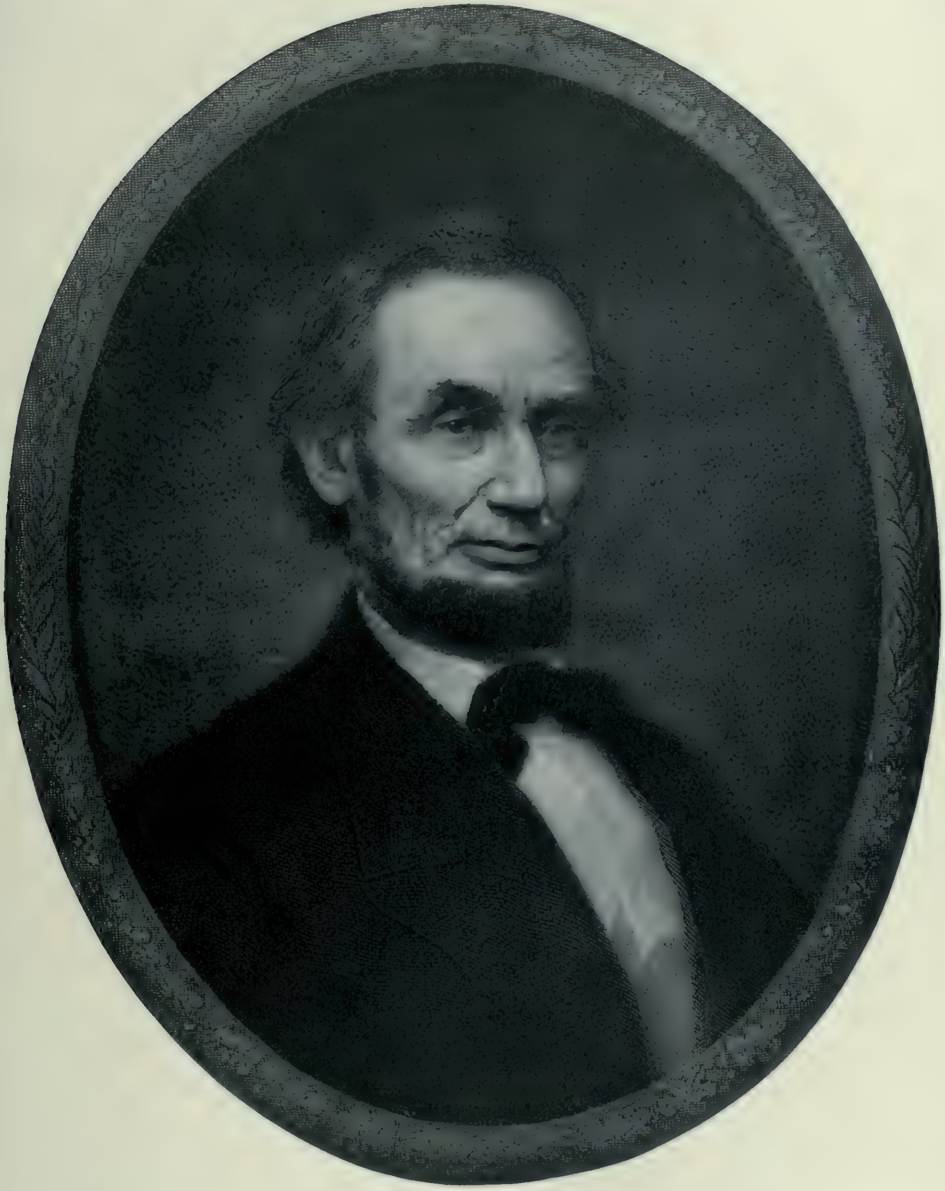
In 1836 Lincoln was again a candidate for the Legislature on the following characteristic platform: "I go for all sharing the privilege of the government who assist in bearing its burdens. Consequently, I go for admitting all whites to the rights of suffrage who pay taxes or bear arms, by no means excluding females." Lincoln stumped the district and by his vigorous speeches won a Whig victory. In the presidential contest of 1836 Lincoln was for Hugh L. White, of Tennessee. In the struggle of Jackson against the United States Bank and the shifting policy of Van Buren he had no interest, but he heeded his duties as a legislator and began that antislavery record upon which so much of his fame will ever rest. The Abolitionists were in the highest activity. Garrison's *Liberator* was intensely annoying to the upholders of slavery. President Jackson had at the close of 1835 invited the attention of Congress to the circulation through the mails of what were then called "inflammatory" documents. Henry Clay, Edward Everett, many of the governors of the Northern States, and a large majority of the House of Representatives strenuously opposed the agitation of the slavery question; all petitions to Congress on the subject were laid on the table without reading or debate, and all possible means were taken to prevent the discussion of the hateful subject. On the night of Nov. 7, 1837, the Rev. Elijah P. Lovejoy was mobbed and shot dead at Alton, Ill., for persisting in publishing an Abolition newspaper.

At this juncture, when the Legislature was about to pass resolutions deprecating the antislavery agitation, Lincoln presented his protest, to which he could get but one signer besides himself. Herein he declares slavery to be founded on injustice and bad policy; but he avers that Abolition agitation tends to increase slavery's evils; that Congress may not interfere with slavery in the States, though it might in the District of Columbia on the request of the people. This protest was meant to avoid extreme views; therefore no mention was made of slavery in the Territories, that point being covered by the Missouri Compromise, which was then in full force. Lincoln was never extreme, and probably till the war began he saw no hour when he would have altered a word in this protest.

When the State capital was removed to Springfield in 1839, Lincoln settled there. Two years before he had been licensed as an attorney, and, being at the capital, he could attend both to his duties as a member of the Legislature and his law practice. His business grew so rapidly that he took into partnership John T. Stuart, a prominent Whig, who had been a good friend also in former years. Lincoln preferred to be the junior in the firm. Springfield was a village of about 1500 inhabitants, and Lincoln was not only poor, but he was in debt.

In 1840 Lincoln was an elector on the Harrison ticket and made speeches in all parts of the State. But one-sided speeches were not suited to his temper; he preferred joint debates, wherein he might employ his masterly skill at retort. A year earlier Lincoln had made the acquaintance of Mary, the daughter of the Hon. Robert S. Todd, of Lexington, Ky., and a sister of the wife of Ninian W. Edwards, of Springfield, a distinguished lawyer. Through her comeliness and her wit the young lady had gained many admirers. Some political papers were contributed by her to a local newspaper; and Lincoln, to shield her, assumed the responsibility, barely avoiding a duel. About six weeks afterward, Nov. 4, 1842, he married Miss Todd.

In 1844 Lincoln was once more an elector on the Clay (Whig) ticket, and in 1846 he was elected to Congress by 1511 majority in a district which two years before had given him only 914. When he took his seat as Representative in the Thirtieth Congress, his great rival, Stephen A. Douglas, was in the Senate. Lincoln was put on the Committee of Post Offices and Post Roads. Though opposed to the Mexican War, he voted for supplies to carry it on. He supported the principle of the Wilmot Proviso and introduced a bill providing for the emancipation of slaves in the District of Columbia, not, however, without compensation to the owners. In 1848 he favored the nomination, by the Whigs, of Taylor for President, and made a strong speech in the House for that purpose, subsequently speaking in various parts of the country. For several years fol-



ABRAHAM LINCOLN
AFTER THE PORTRAIT BY WILLIAM MARSHALL

lowing the expiration of his term in Congress Lincoln was not active in politics. He wished to be Commissioner of the General Land Office, but he did not get the appointment. He was offered the governorship of Oregon Territory, but his wife declined to go there, and he would not accept. In 1850 he refused a nomination for Congress.

His law partnership with Stuart ended April, 1841, when he united in practice with ex-Judge Stephen T. Logan and soon afterward formed a partnership with his best friend, William H. Herndon. As a lawyer, he spoke tellingly and often to the mirth of the court room. Many curious anecdotes are told of the great man as a story-teller, of his power, his energy, his oddities, and his generosity. Though thousands of good stories unknown to Lincoln pass current as having been told by him, it is true that few great statesmen were more capable than he of perceiving the kernel of a tale. He had also a ready and humorous wit and was quick to follow a good parry with a well-aimed thrust. His small fees and his frequent refusals to take cases in which he thought that right was with the other party reflect his abhorrence of the sale of self for money.

The bill offered by Douglas, Jan. 4, 1854, to establish a Territorial government in Nebraska, reopened the antislavery war, and Lincoln was forced to take decided ground against spreading slavery into the Territories. This he did at the State Fair at Springfield, Ill., in October, in a speech of great power. Lincoln had felt that his natural opponent was Douglas, and he seized eagerly this opportunity of refuting his arguments; Douglas recognized his opponent's strength and secured from him a truce from debating for that fall. In November, despite his positive declination, Lincoln was again elected to the Legislature. At the same time he was very desirous to succeed Shields (a Democrat) in the United States Senate, and, although he did not win the election for himself, he won it for Lyman Trumbull, a fellow opponent of the Kansas-Nebraska Act. During the Kansas excitement Lincoln's sympathies were all in favor of the free-State side, but he discountenanced the use of force.

It was at the State Convention at Bloomington in 1856 that the formation of the Republican party in Illinois was consummated, and there Lincoln made one of his greatest antislavery speeches, but it is preserved only in description. On June 17, 1856, at the Republican Nominating Convention at Philadelphia, Lincoln's name was put forth for Vice President and was received with considerable favor, for he got 110 votes. This year, for the third time, Lincoln was on the electoral ticket, now as a Republican, and he made some 50 speeches for Frémont. The quality of these speeches bettered his reputation and spread it even to the East. In April, 1858, the Democrats indorsed the stand Douglas had taken in the Kansas dispute and renominated him for the Senate. Lincoln expected and received the Republican nomination in June, and in accepting he delivered the carefully thought out speech near the beginning of which was the following passage: "'A house divided against itself cannot stand.' I believe this Government cannot endure permanently half slave and half free. I do not expect the Union to be dissolved—I do not expect the house to fall—but I do expect it will cease to be divided. It will become all one thing or all the other." In July he challenged Douglas to the now famous seven debates, the direct result of which was to win the latter the senatorship. Lincoln, however, was not arguing for the senatorial prize alone, but with a greater purpose—he was fighting for Republican success in the presidential contest of 1860, and the opportunity it would bring to "hit hard" the great "moral, social, and political wrong" of slavery.

In April, 1859, the people of his own town began to talk of Lincoln as a proper candidate for President, but he discouraged the idea. In September he made speeches in Ohio in the track of Douglas; in December he spoke at several places in Kansas. He was more and more talked of for a presidential nomination and finally authorized his friends to work for him. On Feb. 27, 1860, on invitation, he appeared in New York and spoke in Cooper Institute. The address was warmly praised in most of the city journals and was in fact highly successful. After this he spoke in many cities in New England. He was present, though not a delegate, at the Illinois State Convention (May 9, 1860), where he received the most flattering evidences of his great popularity, which was fully assured by the adoption without dissent of a resolution declaring him the choice of the Republicans of Illinois for President.

On May 16, 1860, the Republican National Convention met at Chicago. The city was full of political workers. Indeed, no previous convention had had half the number of "outside delegates." Two days were spent in organization and the adoption of a platform. Balloting came on the third day. Up to the previous evening Seward's nomination seemed certain; but the outside pressure for Lincoln was powerful, for his friends were chiefly men of Illinois, and the convention was held in their State. On the third ballot Lincoln won the nomination, and in the afternoon Hannibal Hamlin, of Maine, was nominated for Vice President. The platform adopted, though denying the right of Congress to interfere with slavery in the States, demanded that slavery be forbidden in the Territories. It declared in favor of internal improvements and protection.

The Democratic National Convention at Charleston split on the slavery question. The South, remembering Douglas's admission in debate with Lincoln that "slavery cannot exist a day or an hour anywhere unless it is supported by local police regulations," totally repudiated him and his squatter sovereignty, whereas Douglas was equally determined to stick to it. Most of the Southern delegates withdrew and organized a separate convention. Those who remained voted 57 times for a candidate, Douglas always having the highest number, but not the two-thirds required by Democratic precedent. They adjourned to meet at Baltimore, June 18. The seceders adjourned to meet at Richmond, Va., early in June, but after convening they further adjourned to meet June 28 in Baltimore. The result finally was the nomination of three presidential candidates: Douglas by one convention, Breckenridge, of Kentucky, by the seceders, or extreme Southerners, and Bell (formerly a Whig), of Tennessee, by the Constitutional Union party, composed for the most part of Know-Nothings and old-time Whigs. The canvass was warm on all sides. Lincoln was elected on November 6 by 180 votes, Breckenridge receiving 72, Bell 39, and Douglas 12. The election was strictly sectional, for the Republicans got no electoral vote in a Southern State. Feeling the need of all possible support, Lincoln chose his cabinet carefully, trying to get a varied representation; he wished even to have a Southerner, until his offer to Mr. Graham, of North Carolina, was flatly refused. Meanwhile the South was making ready to secede, and on December 20 the South Carolina Convention unanimously adopted the Ordinance of Secession. The year closed in gloom, and 1861 opened with no hope of peace. On February 4 a peace congress met in Philadelphia; on the same day delegates met at Montgomery, Ala., to form a Southern Confederacy; on the 18th the work was done, and Jefferson Davis was inaugurated President.

On Feb. 11, 1861, Lincoln set out for Washington, taking a rather roundabout road. Everywhere the people were eager to see and hear him. On Monday, March 4, he was inaugurated and delivered an elaborate address, full of the best qualities of his nature. The appearance of the new President is thus described by Ward Lamon, in his *Life of Abraham Lincoln:* "He was about 6 feet, 4 inches high, the length of his legs being out of all proportion to that of his body. When he sat down on a chair, he seemed no taller than an average man, measuring from the chair to the crown of his head; but his knees rose high in front. . . . He weighed about 180 pounds, but he was thin through the breast, narrow across the shoulders, and had the general appearance of a consumptive subject. Standing up, he stooped slightly forward; sitting down, he usually crossed his long legs or threw them over the arms of the chair as the most convenient mode of disposing of them. His 'head was long, and tall from the base of the brain and the eyebrow'; his forehead high and narrow, inclining backward as it rose. . . . The size of his hat was seven and an eighth. His ears were large, standing out almost at right angles from his head; his cheek bones high and prominent; his eyebrows heavy, and jutting forward over small sunken blue eyes; his nose long, large, and blunt, the tip of it rather ruddy, and slightly awry towards the right-hand side; his chin, projecting far and sharp, curved upward to meet a thick lower lip which hung downward; his cheeks were flabby, and the loose skin fell in wrinkles, or folds; there was a large mole on his right cheek, and an uncommonly prominent Adam's apple on his throat; his hair was dark brown in color, stiff, unkempt, and as yet showing little or no sign of advancing age or trouble; his complexion was very dark, his skin yellow, shriveled, and 'leathery.' . . . His countenance was haggard and careworn, exhibiting all the marks of protracted suffering. Every feature of the man—the hollow eyes, with the dark rings beneath; the long, sallow, cadaverous face, intersected by those peculiar deep lines; his whole air; his walk; his long, silent reveries, broken only at intervals by sudden and startling exclamations, as if to confound an observer who might suspect the nature of his thoughts—showed that he was a man of sorrows—not sorrows of to-day or yesterday, but long treasured and deep—bearing with him a continual sense of weariness and pain." Yet this strangely sorrowful man dearly loved jokes, puns, and comical stories, and was himself world-famous for his inimitable narrative powers.

At his inauguration Lincoln denied the right of any State or number of States to go out of the Union. In the South the address was regarded as practically a declaration of war, and preparations were hurried; in the North it was strongly approved, and parties were quickly consolidated. Less than six weeks afterward General Beauregard, on behalf of the Confederate government, bombarded Fort Sumter in Charleston harbor, forcing the surrender of Major Anderson and his small force on April 14. There began the Civil War, and from that day to the day of his death the political biography of Lincoln is nearly identical with the history of the United States. On April 15 he called for 75,000 volunteers, and hundreds of thousands in the first flush of patriotic feeling thronged to enlist. At the same time Lincoln called for a special session of Congress to meet on the Fourth of July. On April 19 he proclaimed a blockade of the Southern ports; on April 27 he authorized the suspension of the writ of habeas corpus. The date for the meeting of Congress had been made distant, to allow the President to develop his policy and to avoid the turmoil that would ensue if the members met in the height of passion. The only direct request made was for 400,000 men and $400,000,000. The request was granted with additions. On July 15 a Democratic member (McClernand, of Illinois) offered a resolution pledging the House to vote any amount of money and any number of men necessary to put down the rebellion and restore the authority of the government. There were only five opposing votes in a House of nearly 300 members.

On July 21 the Union forces were badly defeated at Bull Run and driven in a panic back upon Washington. For a moment this flight had the effect of disheartening the President. General Scott, who was commander in chief when the war broke out, resigned at the end of October, 1861, and Gen. George B. McClellan took his place. McClellan was a skillful tactician and organizer, but slow to strike. Lincoln realized the necessity for acting, but he had not yet gained the knowledge of war that he later acquired. His appointment of Edwin M. Stanton, a man not pleasing to him personally, as Secretary of War (Jan. 14, 1862), was an evidence of great statesmanship, and Lincoln had trials that would have broken a weaker man. McClellan, after waiting and complaining unnecessarily, finally began a campaign in which he was thoroughly baffled by General Lee. In July Halleck was appointed general in chief of the armies of the United States. At the end of August the principal Federal force, under the command of Pope, was defeated in the second battle of Bull Run. On September 16–17 McClellan met Lee in the bloody battle of Antietam in Maryland. This engagement was hardly decisive, but, as the Confederates were forced to give up their invasion, Lincoln chose this moment to issue his proclamation, Sept. 22, 1862, declaring that he would, on Jan. 1, 1863, emancipate the slaves of all the States then or thereafter in rebellion. This proclamation was a military measure, justified as depriving the South to some extent of an advantage it enjoyed. Politically it was of the utmost importance, since it was the means of winning from the antislavery element throughout the North a more hearty support than had previously been accorded and added greatly to the influence of the national government abroad, where economic hardships threatened to conceal the fact that the war was being fought largely to vindicate a great moral principle. The support it received finally showed Lincoln to be right. Before this, though desiring emancipation, he had labored to persuade the Border States to take the step of their own accord, in return for compensation, but he had been unsuccessful. Two years afterward Lincoln said of the proclamation: "As affairs have turned, it is the central act of my administration, and the great event of the nineteenth century." McClellan failed to use his great force to follow Lee after Antietam; Burnside took command and was defeated at Fredericksburg; Hooker was appointed and suffered the disaster of Chancellorsville. Then the tide began to turn. On July 3, 1863, Meade at Gettysburg beat off the second invasion of Lee and won a decisive victory, and on the following day General Grant captured Vicksburg. On Nov. 19, 1863, Lincoln made his immortal speech on the dedication of the National Cemetery at Gettysburg. Meade having failed to follow up his victory over Lee, Lincoln, in March, 1864, complying with the recommendation of Congress, appointed Grant commander in chief. The South was nearly worn out, and Lee's superior generalship could not prevail against Grant's determination and vastly greater resources. On April 9, 1865, Lee surrendered at Appomattox.

On Nov. 8, 1864, Lincoln was reëlected over General McClellan by a vote of 212 to 21; Andrew Johnson was elected Vice President. When Lee's surrender ended the war, Lincoln was busy with plans for reconstruction; but on April 14, 1865, before he could do anything towards utilizing his wisdom in reorganization, he was shot in his box at Ford's Theatre by John Wilkes Booth, a dissipated and fanatical actor. The ball entered Lincoln's brain, and he never regained consciousness. At seven o'clock on the following morning he was dead.

The loss to the country by this death was incalculable, and the assassin injured most of all the people he would have served. The problem of bringing the two sections again into a union which should be more than one of force was as difficult as that of managing the war. To this problem Lincoln would have brought not only his experience, but generosity, utter lack of vindictiveness, incomparable tact, a tried strength which prevented vacillation. Lincoln's most marked characteristic was the accuracy with which he understood the American people. He was wholly honest; he thought fairly and never as a bigoted partisan. As a lawyer, he was weak unless convinced of inherent right in his case, and when he was convinced he relied for victory on a skill in presenting facts which often set the other side in a light clearer than their attorneys could throw on their case. As to what was his religious creed, opinions seem to diverge almost as widely as they do concerning the Bible itself. He conquered by the power of truth. This love for truth, his infinite patience, and his hard thinking seem to have guided him unerringly in every great problem he had to solve. He who had grown up in a drifting, almost illiterate, shiftless society, who had no education save that which he had been able to pick up in hours not devoted to bread getting, directed a foreign policy of dignity, strength, and honesty. Lincoln came of rough, shiftless, poverty-stricken stock, but through inexplicable gifts he wielded in a democracy and with the full consent of the people a power as great as that of the Czar. It was altogether fitting that a man of such charity should have the honor of doing most, not only to save the Union in time of its greatest danger, but also to free his country of slavery. This was his great achievement, but events so great as the formation of the Union Pacific Railroad Company and the inception of the present national banking system also belong to his administration. Some measures taken to repress Northern sympathizers with the South brought upon him harsh criticism. In spite of this the memory of the great President is year by year held in more honor throughout the Union, and the centenary of his birth was celebrated, in February, 1909, with a deeper interest than any other similar event in the nation's history.

Bibliography. Lincoln literature is sufficient of itself to constitute an excellent small library. The standard collection of his *Writings* is that edited by his private secretaries, J. G. Nicolay and John Hay (12 vols., New York, 1905); there is also the "Federal Edition," edited by A. B. Lapsley (8 vols., ib., 1905–06); another, edited by J. H. Clifford and M. M. Miller (8 vols., ib., 1908); and the *Lincoln-Douglas Debates*, edited by E. E. Sparks (Springfield, Ill., 1908). Among the most useful general biographies are: W. H. Lamon, *The Life of Abraham Lincoln from his Birth to his Inauguration as President* (Boston, 1872); W. O. Stoddard, *Abraham Lincoln: The True Story of a Great Life* (New York, 1884); I. N. Arnold, *The Life of Abraham Lincoln* (Chicago, 1885); Nicolay and Hay, *Abraham Lincoln: A History* (10 vols., New York, 1890); Herndon and Weik, *Abraham Lincoln: The True Story of a Great Life* (2 vols., ib., 1892); C. C. Coffin, *Abraham Lincoln* (ib., 1893); J. T. Morse, *Abraham Lincoln* (2 vols., Boston, 1898), in the "American Statesmen Series"; Norman Hapgood, *Abraham Lincoln, the Man of the People* (New York, 1899); I. M. Tarbell, *The Life of Abraham Lincoln* (2 vols., ib., 1900); W. M. Thayer, *Abraham Lincoln, the Pioneer Boy, and how he Became President* (15th ed., London, 1902); W. E. Curtis, *The True Abraham Lincoln* (Philadelphia, 1903); J. G. Nicolay, *A Short Life of Abraham Lincoln* (New York, 1904); Helen Nicolay, *The Boys' Life of Abraham Lincoln* (ib., 1906); James Morgan, *Abraham Lincoln, the Boy and the Man* (ib., 1908); D. J. Snider, *Abraham Lincoln* (St. Louis, 1908). For essays, special studies, and reminiscences consult: F. B. Carpenter, *The Inner Life of Abraham Lincoln: Six Months at the White House* (New York, 1867); Gideon Welles, *Lincoln and Seward* (ib., 1874); L. E. Chittenden, *Recollections of President Lincoln and his Administration* (ib., 1891); J. R. Gilmore, *Personal Recollections of Abraham Lincoln and the Civil War* (Boston, 1898); Carl Schurz, *Abraham Lincoln: An Essay* (ib., 1899, 1907); C. H. McCarthy, *Lincoln's Plan of Reconstruction* (New York, 1901); Alonzo Rothschild, *Lincoln, Master of Men* (Boston, 1906); F. T. Hill, *Lincoln, the Lawyer* (New York, 1906); Carl Schurz, *The Reminiscences of Carl Schurz* (3 vols., ib., 1907–08); H. C. Whitney, *Lincoln the Citizen and Lincoln the President* (ib., 1908); James Creelman, *Why we Love Lincoln* (ib., 1909); A. T. Rice, *Reminiscences of Abraham Lincoln by Distinguished Men of his Time* (ib., 1909); R. W. Gilder, *Lincoln, the Leader, and Lincoln's Genius for Expression* (Boston, 1909); M. C. Peters, *Abraham Lincoln's Religion* (ib., 1909); W. P. Pickett, *The Negro Problem: Abraham Lincoln's Solution* (New York, 1909); M. D. Learned, *Abraham Lincoln: An American Migration* (Philadelphia, 1909); Lea and Hutchinson, *The Ancestry of Abraham Lincoln* (Boston, 1909); S. T. Jackson, *Lincoln's Use of the Bible* (New York, 1909); D. M. Dewitt, *The Assassination of Abraham Lincoln and its Explanation* (ib., 1909); C. E. Laughlin, *The Death of Lincoln* (ib., 1909); J. F. Newton, *Lincoln and Herndon* (Cedar Rapids, Iowa, 1910); C. T. Wettstein, *Was Abraham Lincoln an Infidel?* (Boston, 1910); Elliot Norton, *Abraham Lincoln, a Lover of Mankind* (New York, 1911); Helen Nicolay, *Personal Traits of Abraham Lincoln* (ib., 1912); W. J. Johnson, *Abraham Lincoln, the Christian* (ib., 1913); F. F. Browne, *The Every-Day Life of Abraham Lincoln* (Chicago, 1913); A. E. Pillsbury, *Lincoln and Slavery* (Boston, 1913); C. S. Beardslee, *Abraham Lincoln's Cardinal Traits* (ib., 1914). For a history of the time in which Lincoln was prominent as a leader, see: Garrett and Halley, *The Civil War from a Southern Standpoint* (Philadelphia, 1905); Sikes and Keener, *The Growth of the Nation, 1837 to 1860* (ib., 1905); F. E. Chadwick, *Causes of the Civil War* (New York, 1906); A. B. Hart, *Slavery and Abolition* (ib., 1906); T. C. Smith, *Parties and Slavery* (ib., 1906); J. K. Hosmer, *The Appeal to Arms and Outcome of the Civil War* (ib., 1907); J. F. Rhodes, *History of the United States from the Compromise of 1850* (7 vols., ib., 1910–12).

LINCOLN, Benjamin (1733–1810). An American soldier, prominent in the Revolutionary War. He was born at Hingham, Mass., Jan. 24, 1733, received a common-school education, and was engaged in farming at Hingham until 1774, acting successively as local magistrate, Representative in the Massachusetts Legislature, and colonel of militia. In 1775 he took an active part in organizing the Continental forces, and in 1776 was appointed major general of the Massachusetts militia. At the siege of Boston Washington put him in command of an expedition to force the British fleet out of Boston harbor. He commanded the Massachusetts militia at the battle of White Plains, reënforced Washington by a fresh levy of Massachusetts militia at Morristown, N. J., in February, 1777, and at Washington's request was made a major general in the Continental army on February 19 of that year. He served with marked efficiency in the Burgoyne campaign, both under Schuyler and Gates, being second in command under the latter; and on Oct. 8, 1777, received a wound which maimed him for life and caused his temporary withdrawal from the army. Resuming service in August, 1778, he was assigned to the command of the Southern army in September and arrived at Charleston, December 4. A detachment of his army was defeated at Brier Creek (q.v.) in March, 1779, and his main force met with a severe repulse at Stono Ferry in June. Later he acted in conjunction with the French under D'Estaing against Savannah, but, the combined forces meeting with a sanguinary repulse on October 9, he returned to Charleston, where he was soon besieged by the English under Sir Henry Clinton and was forced to surrender (May 12, 1780), after which he returned to Hingham, Mass., on parole. Exchanged in the spring of 1781, he joined Washington and was chosen by him at Yorktown to receive the sword of Lord Cornwallis. He held the office of Secretary of War in 1781–83 and retired to his farm at Hingham in 1784. In 1786–87 he commanded the Massachusetts militia against Shays and his followers. (See Shays's Rebellion.) He was elected Lieutenant Governor of Massachusetts in 1787, was a member of the State convention that ratified the Constitution of the United States, was one of the commissioners to treat with the Creek Indians in 1789 and with the Indians north of the Ohio at Sandusky in 1793. In 1789 he was made collector of the port of Boston, which position he held until two years before his death. Late in life he took a great interest in science and wrote a number of scientific papers which attracted considerable attention. He was a man of simple, earnest character; and the persevering zeal and disinterestedness of his public service gave him great popularity. Consult the biography by Bowen in Jared Sparks, *Library of American Biography*, vol. xiii (2d series, Boston, 1847).

LINCOLN, John Larkin (1817–91). An American educator. He graduated at Brown University in 1836, was tutor there (1838–41), and professor of Latin from 1844 until his death. He was the editor of *Selections from Livy* (1847), the *Works of Horace* (1851), *Ovid, with Notes* (1883), and the *De Senectute of Cicero* (1887).

LINCOLN, Joseph Crosby (1870–). An American story-writer. He was born at Brewster, Mass., and was educated there and at Chelsea, Mass. In 1896–99 he was associate editor of the *League of American Wheelmen Bulletin*, Boston. He then moved to New York City and engaged in literary work. Besides short stories and verse contributed to magazines, he is author of *Cape Cod Ballads* (1902; new ed., 1910); *Cap'n Eri* (1904; 2d ed., 1909); *Partners of the Tide* (1905); *Mr. Pratt* (1906); *The "Old Home House"* (1907); *Cy Whittaker's Place* (1908; 2d ed., 1910); *Our Village* (1909); *Keziah Coffin* (1909); *The Depot Master* (1910); *Cap'n Warren's Wards* (1911, 1912); *The Woman-Haters* (1911); *The Postmaster* (1912); *The Rise of Roscoe Paine* (1912); *Mr. Pratt's Patients* (1913); *Cap'n Dan's Daughter* (1914); *Kent Knowles: "Quahaug"* (1914). Collectively these form a series of entertaining sketches of Cape Cod life, with many a shrewd bit of character drawing.

LINCOLN, Levi (1749–1820). An American political leader, born at Hingham, Mass. He graduated at Harvard in 1772, was active in the patriot cause, and wrote the series of political discussions called *Farmer's Letters,* and was clerk of the court and probate judge in Worcester County in 1775–81. In 1796 he became a member of the State House of Representatives, and in 1797 of the State Senate. In 1801 he was elected to Congress to fill a vacancy and served from February 6 to March 3, then becoming Attorney-General in Jefferson's cabinet; within the same year (March 5–May 2) he was acting Secretary of State. He was Lieutenant Governor of Massachusetts in 1807–08; was acting Governor from December, 1808, until May, 1809; and in 1811 declined an appointment as associate justice of the United States Supreme Court on account of failing eyesight.

LINCOLN, Levi (1782–1868). An American politician, born in Worcester, Mass., a son of the preceding. He graduated at Harvard in 1802, began to practice law in 1805, served in the State Constitutional Convention of 1820, and was often a member of the Legislature, serving as Speaker of the House in 1822 and as President of the Senate in 1845. He was elected Lieutenant Governor of Massachusetts in 1823, was also a judge of the State Supreme Court in 1824, and was Governor from 1825 to 1834. From 1835 to 1841 he was a member of Congress and in 1848 became the first mayor of Worcester.

LINCOLN, Paul Martyn (1870–). An American electrical engineer. He was born at Norwood, Mich., studied at Western Reserve University in 1888–89, and graduated as electrical engineer from Ohio State University in 1892. He was then employed by the Short Electric Company at Cleveland, Ohio, worked for the Westinghouse Electric and Manufacturing Company at Pittsburgh, Pa., in 1892-95, and was electrical superintendent of the Niagara Falls Power Company from 1895 to 1902. In the latter year he returned to the Westinghouse Company as engineer of their power division and later became general engineer. He was appointed professor of electrical engineering at the University of Pittsburgh in 1910. The Franklin Institute awarded him the John Scott medal in 1902 for his synchronism indicator. Lincoln served as vice president in 1909–11 and as president in 1915 of the American Institute of Electrical Engineers.

LINCOLN, Robert Todd (1843–). An American politician, son of Abraham Lincoln, born at Springfield, Ill. He graduated at Harvard in 1864 and then entered the Federal army as a captain on General Grant's staff. At the close of the Civil War he settled in Chicago and practiced law until 1881, when he entered Garfield's cabinet as Secretary of War. He was retained in this position by President Arthur and in 1884 was mentioned for the presidential candidacy, but refused to oppose Arthur in the convention. From 1889 to 1893 he was Minister of the United States to Great Britain. He was counsel for the Pullman Palace Car Company, and after the death of George M. Pullman was its president. In 1911 he resigned this office and became chairman of the board of directors.

LINCOLN COLLEGE. A college of Oxford University. It was founded in 1427, under the name of the College of St. Mary and All Saints, by Richard Fleming, Bishop of Lincoln, and a former Wiclifite, for a rector and seven fellows, for the benefit of his diocese and the fighting of the Wiclifite heresy. The college was endowed in part by the impropriating of the neighboring parish church. Fleming died shortly after the college was founded, and his work was carried on by John Frost, dean of Wells, who finished the buildings and added others. The foundation was completed by Thomas Rotherham, Bishop of Lincoln, later Archbishop of York and Lord High Chancellor, who reorganized the college under new statutes in 1479–80. By these works he earned the title of second founder. The fellows were originally masters or bachelors of arts, and their election limited to the dioceses of York, Lincoln, and Wells. In 1855 new statutes provided for a rector, 12 fellows, and 14 scholars, and the fellowships were thrown open. The establishment in 1911–12 consisted of a rector, 10 fellows, 27 scholars and exhibitioners, 2 lecturers, college officers, and 114 undergraduates in all. The patronage consists of nine benefices. Of the buildings, the Hall, built in 1437, the chapel, 1631, and the kitchen, a very ancient building, are the most interesting. Among the more distinguished members of the college may be mentioned John Wesley (fellow), Lord Crewe, Bishop Williams of Lincoln, Sir William Davenant, the poet Robert Montgomery, Mark Pattison, John Morley, and James Cotter Morison. Consult Andrew Clark, *Lincoln College* (London, 1898).

LINCOLN GREEN. A color associated with the cloths for which Lincoln, England, was once famous.

LINCOLN MEMORIAL UNIVERSITY. An institution for higher education, founded in 1897, near Cumberland Gap, Tenn. The university was established largely through the efforts of Gen. Oliver Otis Howard. It is nonsectarian. The purpose of the university is to furnish educational advantages to dwellers in the mountain regions of Tennessee and other States. The university owns about 600 acres of land, which includes a beautiful campus which was laid out by Col. George E. Waring. The principal buildings are the Carnegie Library, Avery Hall, the Conservatory of Music, the Auditorium, Norton Hall, Science Hall, Ellen M. Myers Hall, and the President's House. There are also several teachers' and students' cottages. The courses of instruction include a preparatory course, scientific course, classical course, agricultural courses, and a teacher's course. There is also a medical department, consisting of the Lincoln Memorial Hospital and a training school for nurses at Knoxville, Tenn. The Grace Nettleton Home is sustained by the Grace Nettleton foundation of Lincoln Memorial University. This home was founded by Franklin E. Nettleton as a memorial to his daughter. It has for its purpose the care and education of orphan girls. The total number of students in all departments of the university in 1914–15 was 825. Of these 706 were in the university, 86 in the Medical School, and 33 in the Nurses Training School. The library contains about 5000 volumes. The president in 1914 was George A. Hubbell, Ph.D.

LINCOLN MONUMENT. A monument in the Oak Ridge Cemetery of Springfield, Ill., marking the burial place of Abraham Lincoln. It was erected in 1874 at a cost of over $200,000 and consists of a granite structure of imposing dimensions, surmounted at a height of 120 feet by a bronze statue of the martyr President.

LIN'COLNSHIRE. A maritime county of England, the second largest in the country, bounded north by Yorkshire, east by the North Sea (Map: England, F 3). Area, 2638 square miles. The surface generally is flat, a large part protected by embankments lying below the level of the sea, and forming part of the so-called Bedford Level. The county is divided into three districts—Lindsey on the northeast, on which are the Lincoln Wolds or Chalk Hills, Kesteven on the west, and Holland on the south. The chief rivers are the Trent, Witham, Welland, and the Humber, which separates the county from Yorkshire on the north. The soil is fertile, and agriculture is in an advanced state, nine-tenths of the land being under cultivation; barley is the chief crop; stock raising is a thriving industry, and there are important fisheries. Practically no minerals are found, and the manufactures of the county are very small. Capital, Lincoln. Pop., 1901, 498,780; 1911, 563,960.

LINCOLN'S INN. One of the four great guilds or societies of lawyers in England, known as inns of court, which enjoy the exclusive power of calling persons to the bar. It derives its name from the fact that the group of buildings in London occupied by it belonged to the Earl of Lincoln in the reign of Edward II. It became an inn of court soon after his death in 1310. See Inns of Court.

LINCOLN'S INN FIELDS. A great square in London near the Courts of Justice, laid out by Inigo Jones and named from Lincoln's Inn, which stands on the east side of the square. The Royal College of Surgeons faces the square on the south and the Sloane Museum on the north. The place was formerly notorious as a resort of beggars and thieves and was the scene of a number of executions for political offenses.

LINCOLN UNIVERSITY. See James Milliken University.

LINCRUS'TA-WAL'TON (Neo-Lat., from Lat. *linum*, flax + *crusta*, crust, hard surface). An embossed wall covering, designed as a substitute for wall papers, natural woods, or plaster modeling. It was named for its inventor, Frederick Walton. The material consists of linseed oil with which is mixed wood fibre or other thickening substance such as cork, cellulose, or paper. The mixture after being treated chemically is made into sheets, which are then backed with light canvas and stamped in an ornamental pattern. It is waterproof, warm, and washable. The original color is light brown or gray, but when mounted on the wall it may be painted, bronzed, or gilt. The figures may be stamped in high relief with striking effect. Lincrusta is really a variety of linoleum (q.v.).

LIND, Jenny (Madame Goldschmidt) (1820–87). A celebrated singer, popularly known as "the Swedish Nightingale." She was born at Stockholm, of humble parentage. Her wonderful voice was first noticed by an actress, through whose influence she was afterward admitted, at the age of nine, into the Stockholm Conservatory of Music, at which place she became the pupil of Crœlius and Berg. Through the school of singing attached to the Court Theatre, she was enabled to make her début (1838) as Agathe in *Der Freischütz*, in which her success was instantaneous. In 1841 she passed a period of nine months in study with Manuel Garcia in Paris. In Berlin (1844), where she had gone to study German, she sang the rôle of Vielka in Meyerbeer's *Feldlager in Schlesien*, written specially for her. In April, 1845, she made an extensive tour throughout continental Europe, during which she met with unequaled success, her singing at the Leipzig Gewandhaus firmly establishing her reputation and securing for her an engagement for the Vienna Opera. Her first appearance in England was in 1847. From 1850 to 1852 she made a tour of the United States, which was as successful from the financial point of view as it was from the artistic. She was married in Boston in 1852 to Otto Goldschmidt, who was conducting the Bach Choir. After her return to Europe she lived for a few years at Dresden and afterward settled in London. Her last public appearance was at Düsseldorf at the festival of the Lower Rhenish Musical Society in 1870. As early as 1849 she retired from the operatic stage, devoting herself exclusively to concert singing. Possibly no other stage artist has been so popular throughout the world for her personal qualities as Jenny Lind. She was widely known for her generosity. Her voice was a soprano of bright, brilliant, thrilling, and sympathetic quality, her principal accomplishment being an unrivaled mastery of coloratura. She invariably improvised her own cadenzas, which were always in exquisite taste. She died at Malvern Wells. A bust of Jenny Lind was unveiled in Westminster Abbey in 1894. Consult: Rockstro and Holland, *Jenny Lind, the Artist* (London, 1891); Rockstro and Goldschmidt, *Jenny Lind: Her Vocal Art and Culture* (ib., 1894); C. A. Wilkens, *Jenny Lind* (Gütersloh, 1913).

LIND, John (1854–). An American public official, born at Kanna, Småland, Sweden. He came to the United States with his parents in 1868 and settled in Minnesota at Goodhue, taught school in Sibley County in 1872–73, attended the State University in 1875–76, and was admitted to the bar in 1876. He then practiced law at New Ulm and later at Minneapolis, and served as receiver in the United States Land Office at Tracy (1881–85). He was a Republican member of Congress from 1887 to 1893, but by 1896 had changed his political allegiance and become an enthusiastic advocate of free silver. In this year he was unsuccessful as Democratic candidate for Governor of Minnesota, but in 1898 he was elected. Two years later, despite the record of an efficient and progressive administration, he was defeated for reëlection. During the Spanish-American War he served as a first lieutenant in the Twelfth Minnesota Volunteers. From 1903 to 1905 he was again in Congress, where he was outspoken in his denunciation of imperialism. In August, 1913, he was appointed the Envoy and personal representative in Mexico of President Wilson, and thereafter, until the mission was abandoned in April of the next year, kept the government informed regarding the complicated situation incident to the Huerta (q.v.) régime.

LINDAU, lĭn'dou. An ancient town of Bavaria in Swabia, situated on an islet at the northeast end of Lake Constance, 1300 feet above the sea (Map: Germany, C 5). It is connected with the mainland by an old wooden bridge and a railway embankment. Its excellent harbor has two lighthouses; at the entrance is the colossal statue of a lion. The recently restored fifteenth-century Rathaus, with the museum of antiquities, and the ancient Roman tower are interesting structures. The educational institutions of Lindau include a Latin school dating from 1530, a Realschule, and the ancient town library with about 14,000 volumes, many of them rare books on the classics and medicine. There are manufactures of condensed milk and breadstuffs; extensive fisheries; and an important trade in agricultural and dairy products, iron, and wood. Pop., 1900, 5853; 1910, 6618. Lindau is believed to occupy the site of the Castrum Tiberii erected by the Romans against the Vindelicians. The city is mentioned as early as 774, and in

1274 it was a free Imperial city. It joined the Schmalkaldic League in 1531, passed in 1804 to Austria and in 1805 to Bavaria.

LINDAU, Paul (1839–1919). A German dramatist, novelist, and essayist, born at Magdeburg. He studied at Halle and Berlin. For several years he lived in Paris, where he became deeply affected by the French literary spirit. Returning to Germany in 1863, he edited the *Düsseldorfer Zeitung* for a year, then went to Berlin, and in 1866 to Elberfeld, where he edited the *Elberfelder Zeitung*. In 1869 he founded in Leipzig *Das Neue Blatt*, and in 1872 in Berlin *Die Gegenwart*, which he edited till 1881. *Nord und Süd*, founded by him in 1878, he continued to edit till 1904. From 1895 to 1899 he was director of the Court Theatre in Meiningen, then of the Berlin Theatre, and later of the Deutsches Theater of Berlin. Subsequently he became dramatic critic of the Royal Schauspielhaus. In 1883 he had visited the United States as the guest of Henry Villard for the opening of the Northern Pacific Railway and had traveled widely in the West; his letters of this period to the *National-Zeitung*, Berlin, were later collected as *Aus der neuen Welt* (1884). Lindau is author of some 60 volumes of dramas, stories, sketches, and critical or controversial pamphlets, as well as of many dramatic adaptations. From 1872 to 1886 he was perhaps the most prominent literary man in Germany, but since then his fame has waned. The feuilleton style, which he learned in Paris, did very well in its place, but when applied to the drama brought first success and then failure, for his plays are empty, though possessing some superficial brilliancy. His novels show keen observation, especially of Berlin society life, but lack all deeper poetic value. His critical papers amuse, but have little lasting worth. The more noteworthy of his critical essays are *Harmlose Briefe eines deutschen Kleinstädters* (1870), *Litterarische Rücksichtslosigkeiten* (1871), and *Dramaturgische Blätter* (1875–99). To the study of French literature he contributed essays on *Molière* (1872) and *Alfred de Musset* (1877). The more noteworthy of his novels are *Herr und Frau Bewer* (12th ed., 1909), *Spitzen* (trans. as *Lace*, 1888), and *Der Tag nach der Westen* (1886; 11th ed., 1908), which has perhaps maintained itself best. His best plays—*Maria und Magdalena* (1872), *Gräfin Lea* (1881), and *Ein Erfolg* (1875)—are noteworthy for their technique, their instinct of stage effect, and their bright and witty dialogue. Lindau's collected dramas appeared in five volumes (Berlin, 1873–88). Consult: Egmont Hadlich, *Paul Lindau als dramatischer Dichter* (Berlin, 1876); Franz Mehring, *Der Fall Lindau* (ib., 1890); Victor Klemperer, *Paul Lindau* (ib., 1909).

LINDAU, Rudolf (1829–1910). A German diplomat and novelist, brother of Paul Lindau, born Oct. 10, 1829, in Gardelegen. He was for many years in the consular and diplomatic service of Switzerland and Germany. Lindau studied in Montpellier and Paris; he contributed to the *Revue des Deux Mondes*, the *Figaro*, and the *Journal des Débats*. From 1859 to 1869 he lived in the Far East and in California. In 1864 with Charles Rickerby he founded the *Japan Times* at Yokohama. In 1869 he returned to Germany, was war correspondent in the Franco-Prussian War, and from 1872 to 1878 was employed at the German Embassy in Paris. After that he lived chiefly in Berlin. His writings in French and English prove him a thorough cosmopolitan. Although less known as a littérateur than his brother Paul, he shows greater artistic ability. Wide travel and keen observation of men and manners are obvious in his works: *Un voyage autour du Japon* (1864); *Peines perdues* (1880), short stories; *The Philosopher's Pendulum, and Other Stories* (1883); in German: *Die preussische Garde im Feldzuge, 1870–71* (1872); *Robert Ashton* (1879); *Schiffbruch* (2d ed., 1880); *Gute Gesellschaft* (2d ed., 1883); *Der Gast* (1883); *Zwei Seelen* (1888); *Martha* (1892); *Liebesheiraten* (1894); *Aus China und Japan* (1896); *Türkische Geschichten* (1891; 2d ed., 1903); *Der Fanar und Mayfair* (1898); *Zwei Reisen in der Türkei* (1899); *Ein unglückliches Volk* (1903); *Alte Geschichten* (1904). He was a pupil of Turgenev. Lindau's *Gesammelte Romane und Novellen* came out at Berlin in six volumes (1892–93). Consult Erich Schmidt, *Charakteristiken*, vol. ii (Berlin, 1901), and Heinrich Spiero, *R. Lindaus Leben und Werke* (ib., 1909).

LINDBLAD, lĭnd′blȧd, Adolf Fredrik (1801–78). A Swedish composer, born at Skenninge, near Stockholm. He went to Berlin to study music under Zelter, but in 1835 settled in Stockholm. He composed more than 200 charming songs which were made popular by his pupil, Jenny Lind. They are distinctly Swedish in melody and harmony. He also wrote an opera, *Frondörerna*, a symphony, which was given by the Leipzig Gewandhaus, and a delightful violin sonata. He died in Stockholm.

LINDE, lĭn′de, Samuel Bogumil (Gottlieb) (1771–1847). A Polish lexicographer, born at Thorn, Prussia. He studied at Leipzig, where he subsequently taught Polish, and was employed in a private library in Vienna. In 1803 he was appointed director of the lyceum of Warsaw, where he died. His *Wörterbuch der polnischen Sprache* (6 vols., Warsaw, 1807–14; 2d ed., enlarged, Lemberg, 1854–60) has retained much of its scientific value.

LINDEGREN, lĭn′d*e*-grän, Amalia (1814–91). A Swedish genre and portrait painter, born at Stockholm. She painted for several years without instruction, and then studied at the Stockholm Academy. Afterward she obtained a traveling purse and studied in Paris under Tissier and Cogniet. Still later she visited Munich and Rome. Her works are genre and portraits, usually freshly painted representations of children or family life, and she is the most popular of Swedish women painters. Her "Grandfather and Granddaughter" (1853) and "Mother and Baby" are in the Christiania Gallery, and the "Dance in a Peasant's Cottage" and portraits of Queen Louise and the Crown Princess of Denmark are in the Stockholm Museum. She was elected to the Stockholm Academy in 1856.

LINDEMAN, lĭn′d*e*-mȧn, Ludvig Mathias (1812–87). A Norwegian organist and musical theorist, born at Trondhjem of a family of musicians. At 10 he played with his father in concert, at 12 he became a church organist, and from 1839 to his death he was organist in Christiania. With a government stipend, he visited all parts of the country, collecting popular songs and melodies, and published *Ældre og nyere Norske Fjeldmelodier*, text and 1000 melodies. There followed *Melodier til Landstad's Salmebog* (1871), *Norske Folketoner*, to

Petter Dass' songs (1878), and *Norske Kjæmpevisemelodier* (1884). As Norway's foremost musical theorist and contrapuntist Lindeman worked for better singing at public worship, and in 1877 his great *Koralbog* was authorized for use in the schools and the churches. In 1871, with noted composers, he was invited to the dedication of the great organ in the Royal Albert Hall, London. On this occasion he gave many concerts. Among his own compositions are cantatas, fantasias, piano sonatas, songs for choirs, and more than 380 hymns. He was connected with many musical organizations, and with his son founded the conservatory in Christiania (1883).—The son, Peter Brynie Lindeman (1858–), organist and composer, studied with his father in Stockholm and in Dresden. He succeeded his father as director of the conservatory, published many of his works, and composed numerous works of his own.

LINDEMANN, lĭn′de-män, Ferdinand (1852–). A German mathematician, born in Hanover. He studied at Göttingen, Erlangen (where he took his degree in 1873), Munich, London, and Paris. He began teaching in Würzburg in 1877 and in the same year was made professor at Freiburg. He was called to a chair at Königsberg in 1883 and 10 years later to Munich, where he was rector in 1904–05. He is celebrated for having given the first proof that π is a transcendental number, and that therefore the circle cannot be squared (see the article Circle) by the use of the compasses and the unmarked straightedge. In 1900 he was awarded the Steiner prize. Lindemann's contributions were chiefly in the form of memoirs published in the *Proceedings* of the Royal Bavarian Academy of Sciences and of other societies. He also published *Untersuchungen über den Riemann-Roschschen Satz* (1879), edited Clebsch's *Vorlesungen über Geometrie* (1877–91; 2d ed., 1904), and translated, partly with his wife, various works of Henry Poincaré and Picard.

LINDEMANN-FROMMEL, frŏm′mel, Karl August (1819–91). A German painter and lithographer, born at Markirch, Alsace. He studied in Munich under Rottmann and under his uncle Frommel, director of the Karlsruhe Gallery. In 1845–49 he lived in Rome, thence went to London, where his water colors were much appreciated, and once more was attracted to Munich, but soon left it again for Paris, where he first began to paint in oil, and where Ingres showed especial interest in his compositions. In 1856 he settled permanently in Rome, and in 1878 was appointed professor at the Accademia di San Luca. His works are distinguished for romantic conception and lustrous coloring, and include, among many other fine views of Italian scenery: "The Cloister at Albano," in the Vienna Museum; "Gulf of La Spezia," in the Karlsruhe Gallery; "Bay of Naples"; and "The Imperial Palaces in Rome."

LINDEN, lĭn′den. A town in the Province of Hanover, Prussia. Until 1885 it was a suburb of the city of Hanover, from which it is divided by the Ihme. It has a fine town hall, a Gymnasium, and manufactures of cast iron, steel, machinery, salt, pottery, carpets, celluloid, textiles, chemicals, sugar, rubber, ultramarine, asphalt, wagons, and bricks. Pop., 1900, 50,423; 1910, 73,379.

LINDEN. Various species of the genus *Tilia*. See Lime Tree.

LINDENAU, lĭn′de-nou, Bernhard August von (1779–1854). A Saxon statesman and astronomer, born at Pohlhof, near Altenburg. He studied law and political economy at the University of Leipzig. After serving as assistant judge at the tribunal of Altenburg he was from 1804 to 1817 director of the observatory at Gotha. He traveled through most of the countries of the Continent, and after holding several minor offices was put at the head of the Saxon Ministry in 1831. During his premiership he remodeled the Saxon administration and adapted it to modern requirements. He resigned in 1843. Of his scientific publications, the following deserve mention: *Tables barométriques pour faciliter le calcul des nivellements et des mesures des hauteurs* (1809) and *Geschichte der Sternkunde im ersten Jahrzehnt des neunzehnten Jahrhunderts* (1811).

LINDEN FAMILY. A family of plants. See Tiliaceæ.

LINDENSCHMIT, lĭn′den-shmĭt, Ludwig (1809–93). A German archæologist, brother of Wilhelm Lindenschmit, the painter. He was born at Mainz and at first studied art in Munich under Cornelius, but in 1846 he took up German antiquities. In 1848, with his brother, he wrote *Das germanische Todtenlager von Selzen*, an important contribution to the subject of Germanic sepulchral mounds. In 1851 he was put in charge of the Germanic Central Museum at Mainz. His publications include *Die Alterthümer unserer heidnischen Vorzeit* (8 vols., 1858–91) and *Tracht und Bewaffnung des römischen Heeres während der Kaiserzeit* (1882).

LINDENSCHMIT, Wilhelm (the Elder) (1806–48). A German historical painter, brother of Ludwig Lindenschmit. He was born at Mainz and studied at the academies of Munich and Vienna. In 1826 he returned to Munich to assist Cornelius in his decorative work in the arcades of the royal garden, the Königsbau, and the loggia of the Old Pinakothek, and soon afterward executed in the castle of Hohenschwangau a series of fresco paintings representing episodes in Bavarian history. He also adorned the ducal castle of Landsberg in Meiningen with frescoes from the history of the house of Wettin. His work shows thorough knowledge of history and costume, but is wanting in true pictorial qualities. Among his easel pictures are the "Battle of Arminius" (1839, Karlsruhe Gallery), "Entry of Otho the Great into Augsburg after the Victory on the Lechfeld," and "Death of Duke Luitpold" (gallery at Mainz).

His son, Wilhelm the Younger (1829–95), was also an historical painter. He was born at Munich and studied in Mainz under his uncle, Ludwig Lindenschmit, then at the Academy of Munich, the Städel Institute in Frankfort, the Antwerp Academy, and finally in Paris, where he produced "The Harvest" and "Duke Alba and the Countess of Rudolstadt," now both in the Hamburg Gallery. In 1863 he settled in Munich, where he was appointed professor at the Academy in 1875 and soon attracted a large following. He belonged to the group of historical painters whose work, while historically accurate in detail, is artificial and lacking in creative force and imagination. Among his numerous compositions, some representing mythological or legendary subjects, are "The Fisherman and the Mermaid" (1868, Schack Gallery, Munich); "Ulrich von Hutten Fighting French Nobles" (1869, Leipzig Museum); "Luther's Disputation with Cardinal Cajetan at Augsburg" (Wiesbaden Gallery); "Walter Raleigh in the Tower Visited by his Family" (1873, Königsberg Museum); "Assassination of William of Orange" (1872, Vienna Museum); "Venus by the Body of Adonis" (1874, New Pinakothek, Munich); "Entry of Alaric into Rome" (1886); "The Protest of Luther" (Metropolitan Museum, New York). For the Magistrates' Room in the new city hall at Munich he executed the mural painting, "Progress of Munich under Ludwig I."

LINDENTHAL, lĭn′den-täl, Gustav (1850–). An American bridge builder, born at Brünn, Austria. He was educated at the schools of his native city and of Vienna; was engaged in railroad and bridge construction in Austria and Switzerland in 1870–74; and came to the United States in the latter year. He served as an engineer of the Centennial Exposition, Philadelphia, in 1874–77; and thereafter was a consulting engineer in Pittsburgh, Pa., and in New York City after 1890. He constructed many bridges in Pennsylvania and across the Mississippi River and elsewhere, and designed a suspension bridge across the Hudson River, New York City, not built up to 1915. While serving as commissioner of bridges for New York City under Mayor Low in 1902–03, he introduced the eyebar-chain suspension design in the Manhattan Bridge. He was a member of the board of consulting engineers for the Pennsylvania tunnels and terminals, New York City, and was also consulting engineer and architect of the three-miles-long Hell Gate Bridge across the East River, New York, which was to be completed about 1917 and which at the time of its construction had the longest steel arch in the world. (See Hell Gate; New York [City], *Intercommunication.*) The Polytechnicum, Dresden, gave Lindenthal the degree of Doctor of Engineering in 1911.

LINDERBERG, lĭn′der-bĕrg, (Peder Theodor) Fernando (1854–). A Danish Socialist, born in Copenhagen. He was educated at Vallekilde, was early a gardener in Norway, and later worked as a journalist in Copenhagen (1881). Much interested in Henry George's doctrines, he founded the Danish Workingmen's Union to further social reform and was its leader from 1889 to 1895. He wrote *Henry George og hans social Program* (1899) and *Frikonkurrencen og Socialismen* (1895), which attracted much attention and enabled him to study abroad. Upon his return he published *Karl Marx og den historiske Socialisme* (1899), and organized the Labor Bureau and Library, becoming its leader and editor of its organ, *Samfundets Krav* (1900–10). The object of this institution was the publication of information about social conditions and movements in all lands. He wrote, besides the works already mentioned: *Kristendommen og den sociale Udvikling* (3 vols., 1903–08), his principal work; *Samfundet og dets ökonomiske Udvikling* (1907); *Sociale Hoveddataer i England* (1911); *Sociale Tilstande og Bevægelser ude og hjemme* (1912); *Biskop Ketteler og Socialismen i Tyskland* (1913). His teachings approach those of the Christian Socialists.

LIN′DERMAN, Henry (1825–79). An American financier, born at Lehman, Pa. He studied medicine in New York and in 1853 removed to Philadelphia, where, after practicing his profession for a short time, he was made chief clerk of the Mint in 1855–64, and its director in 1866–69. He made a valuable report on the silver market in 1872; proposed the coinage of the trade dollar; and with Knox drew up the Coinage Act of 1873. As superintendent of the Mint he wrote annual reports, of which that of 1877, arguing for a gold standard, is best known and most important.

LIND′GREN, Waldemar (1860–). An American geologist, born at Kalmar, Sweden. He was educated in Sweden, and graduated from the School of Mines, Freiberg, Germany, in 1883. He served as geologist from 1884 to 1911 and as chief geologist in 1911–12 of the United States Geological Survey, and in the latter year he became professor of economic geology at Massachusetts Institute of Technology. He is author of a treatise on *Mineral Deposits* (1913) and of many official bulletins and reports.

LINDH, lĭnd, Anders Theodor (1833–1904). A Swedish-writing Finnish poet, born at Borgå. At first a pupil in the School of Forestry at Stockholm, he afterward studied law and became one of the magistrates of his native town. His works include two volumes of poetry (1862–75) which are very popular in Finland; two dramas of less importance, *Konung Birger och hans Bröder* (1864) and *Maria af Skottland* (1865); and a translation of Byron's *Hebrew Melodies* (1862).

LIN′DISFARNE. An island in the North Sea. See Holy Island.

LIND′LEY, John (1799–1865). An English botanist, born at Catton, near Norwich. He early devoted himself to the study of botany and in 1819 published *Observations on the Structure of Fruits*, a translation from Richard's *Analyse du Fruit*. The next year he published an original work entitled *Monographia Rosarum*. In 1822 he accepted the position of garden assistant secretary of the Horticultural Society, was promoted to assistant secretary in 1826, and in 1830, in conjunction with George Bentham, organized the first flower shows held in England. He became vice secretary of the society in 1841 and member of council and honorary secretary in 1858. He was professor of botany at the University of London for one year (1829) and then held a like chair at University College, London, until 1861. He was also lecturer in botany for the Apothecaries' Company at Chelsea (1836–53). As a lecturer he was remarkably clear and concise, attracting large audiences. It was chiefly through his enthusiasm that great popular interest was developed in England in the cultivation of plants, and as editor of the *Gardener's Chronicle* (1841–65) he exerted great influence in encouraging public exhibitions of flowers and fruits. He was an untiring writer and editor, and his botanical textbooks were long standard in England. His titles are very numerous, but probably his most significant work was *The Vegetable Kingdom* (1846), followed in importance by *Theory and Practice of Horticulture* (1842) and *Fossil Botany* (1831), with William Hutton.

LINDLEY, Nathaniel, Baron (1828–1921). An English jurist. He was born at Acton Green, Middlesex, was educated at University College, London, and was called to the bar at the Middle Temple in 1850. He was appointed queen's counsel in 1872 and judge of the Court of Common Pleas in 1875, when he was knighted. From 1881 to 1897 he was Lord Justice of Appeal, and from 1897 to 1900 Master of the Rolls. In 1900 he was made a life peer, and from then to 1905 was Lord of Appeal in Ordinary. His publications include: *Introduction to the Study of Jurisprudence* (1855); *A Treatise on the Law of Partnership* (1860; 8th ed., 1912); *A Treatise on the Law of Companies* (6th ed., 1902).

LINDLEY, William (1808–1900). An English civil engineer, born in London. In 1838 he went to the Continent to be engineer in chief of the railroad from Hamburg to Bergedorf. At Hamburg he had charge of many important engineering works, including sewerage and water works, city gas works, public baths and washhouses, and harbor improvements. He left Hamburg in 1860; became consulting engineer of Frankfort-on-the-Main in 1865; and retired in 1879. Lindley introduced into sewerage and water-works construction many new features later widely adopted.

LINDNER, lĭnt′nẽr, Albert (1831–88). A German dramatist, born at Sulza and educated at Jena and Berlin. His earlier plays, *Dante Alighieri* (1855) and *William Shakespeare* (1864), were succeeded by the popular *Brutus und Collatinus* (1867), with which he won the Schiller prize. Among his later plays are *Staud und Welf* (1867); *Katharina II.* (1868); *Die Bluthochzeit oder die Bartholomäusnacht* (1871), a great success; *Marino Falieri* (1875); *Don Juan d'Austria* (1875); *Der Reformator* (1883). Consult A. von Hanstein, *Albert Lindner, Leben und Werke* (Berlin, 1888), and Hans Litterberger, *Studien zum Drama der Gegenwart* (Munich, 1896).

LINDNER, Theodor (1843–). A German historian, born at Breslau and educated there and in Berlin. In 1876 he went to Münster as professor of history, and from there in 1888 to Halle. His works include: *Geschichte des deutschen Reiches vom Ende des vierzehnten Jahrhunderts bis zur Reformation* (1875–80); *Kaiser Heinrich IV.* (1881); *Urkundenwesen Karls IV. und seiner Nachfolger* (1882); *Geschichte des deutschen Volkes* (1894); *Der Krieg gegen Frankreich und die Einigung Deutschlands* (1895); *Weltgeschichte seit der Völkerwanderung* in nine volumes (7 vols., 1901–10).

LIN′DO, Mark Prager (1819–77). A Dutch author, born in London of English parentage. He studied at Boulogne and Düsseldorf, taught in the military school at Breda from 1853 to 1865, and in the latter year went to The Hague as inspector of education in South Holland. Under the pseudonym "De oude heer Smits," he made himself famous by his sketches in the *Arnhemsche Courant*. They were published in book form (1858–65) and were collected in five volumes as *Kompleete werken van den ouden heer Smits* (1877–79). In the *Nederlandsche Spectator*, founded by him in 1856, much of his best work appeared: *Clementine* (1858), *Le Saltimbanque* (1859), and *De geschiedenis van een gentleman* (1862). He translated into Dutch Sterne's *Tristram Shandy* and many of the novels of Thackeray, Scott, Fielding, Dickens, and others. His last work was the historical *De opkomst en ontwikkeling van het Engelsche volk* (1856–73).

LINDPAINTNER, lĭnt′pīnt-nẽr, Peter Joseph von (1791–1856). A German musical conductor and composer, born at Coblenz. He studied at Augsburg, then at Munich under Winter, and somewhat later under Grätz, the contrapuntist. From 1812 to 1819 he was director of music at the Isarthor Theater of Munich, and from 1819 until his death was court kapellmeister at Stuttgart. He developed at Stuttgart one of the best of German orchestras. In 1853 he conducted the New Philharmonic concerts in London. As a composer he lacked originality and depth, but was clear, brilliant, and musician-like. Many of his songs, notably *Die Fahnenwacht*, were very popular in their time. He also wrote 28 operas, symphonies, and chamber music.

LINDSAY, lĭn′zĭ. The county seat of Victoria Co., Ontario, Canada, on the Scugog River, 65 miles northeast of Toronto (direct) on the Grand Trunk and Canadian Pacific railroads (Map: Ontario, F 5). It is connected by steam communication with the Trent Valley Canal. It contains the county buildings, a collegiate institute, and a Roman Catholic convent. It is an important railway centre, with a trade principally in lumber, grain and flour, and manufactures of doors, sashes, blinds, ironwork, beer, agricultural implements, carriages, woolen goods, boots and shoes, and extract of hemlock bark. The United States is represented by a consular agent. Pop., 1901, 7003; 1911, 6964.

LINDSAY. A Scottish family of Norman extraction. One of the race obtained lands in England from William the Conqueror; another, Sir Walter de Lindsay, settling in Scotland under David I, acquired Ercildoun and Luffness in East Lothian. The more prominent among a long list of illustrious descendants are the following; William Lindsay of Ercildoun, High Justiciary of Lothian in the latter half of the twelfth century, who acquired the lands of Crawford in Clydesdale; he married Princess Marjory, sister of King William the Lion, and had three sons, the eldest of whom inherited Crawford.—Sir Alexander Lindsay, younger brother of Sir James Lindsay of Crawford (conspicuous at the battle of Otterburn), and his son David, who became chief of the family, married the sister of Robert III, and was raised by that King in 1398 to the dignity of Earl of Crawford.—David, fifth Earl, a faithful friend of James III, and employed by him in his most important foreign embassies, who was made Duke of Montrose in 1488, a title which had never before been bestowed in Scotland but on princes of the blood royal.—Sir John Lindsay, who in 1445 was created Lord Lindsay of the Byres; the tenth Lord Lindsay of the Byres, in 1644 created Earl of Lindsay, who also became seventeenth Earl of Crawford, and held the offices of High Treasurer of Scotland and Extraordinary Lord of Session; Lord Menmuir, a Lord of Session and Secretary of State to James VI; and Alexander William Lindsay, twenty-fourth Earl of Crawford and Balcarres (q.v.). Consult Lord Lindsay, *Lives of the Lindsays; or a Memoir of the Houses of Crawford and Balcarres* (London, 1849).

LINDSAY, Alexander William Crawford, Earl of Crawford. See Crawford.

LINDSAY, or **LYND(E)SAY**, Sir David (c.1490–1555). The most popular of the early Scottish poets. He seems to have been born at Garmylton. He studied at the University of St. Andrews about 1505–08 and seems to have attached himself at once to the Scottish court as equerry (1508). In 1511 he took part in a play before James IV and Margaret Tudor at Holyrood. He became an usher to Prince James, afterward James V of Scotland, an office which he held till 1522. In this year he married Janet Douglas, described as the King's seamstress. About 1528 James V appointed him

Lyon king-at-arms (chief court herald), in which capacity he was sent on several diplomatic missions. He died before April 18, 1555. The earliest of his poems, *The Dreme* (written about 1528, though not published till 1558), is an allegory written in the seven-line stanza of Chaucer. The poet is conducted by Dame Remembrance through earth to hell and purgatory, back to the earth, and finally to heaven. The vision closes with an account of the dreadful state of Scotland—the robbery and oppression in the Highlands and on the borders. This poem was soon followed by *The Testament and Complaynt of our Soverane Lordis Papyngo* (1530), a satire on the court, prelates, and nobles, and by the *King's Flyting* (?1536), an audacious rebuke of the King's licentiousness. For the feast of Epiphany, Jan. 6, 1540, Lindsay wrote his famous morality play, *Ane Satyre of the Thrie Estaitis*, in which he denounced the clergy with especial severity. In 1554 he completed a long poem (6333 lines) called *The Monarchie*, which gives an account of the rise and fall of Assyria, Persia, Greece, and Rome, closing with a prophecy of the fall of the fifth world monarchy, the Church of Rome. Other poems are: *The Complaynt of Bagsche, the Kingis Auld Hound, to Bawtie, the Kingis Best Belovit Dog, and his Companions*, a satire on the court; *The Historie and Testament of Squyer Meldrum*, a metrical romance, having as a hero a contemporary Scottish laird; *Kittie's Confessions*, aimed at the confessional; *Ane Description of Peder Coffer*, an exposure of peddlers' tricks. For a century Lindsay's satires, abounding in humor and proverbial philosophy, were read throughout Scotland. They seem to have lost their popularity chiefly because the language in which they were written became unintelligible to all except scholars. In furthering the Reformation in Scotland they played a part hardly second to the sermons of John Knox. *The Thrie Estaitis* occupies a considerable place in the development of the drama. Consult his *Poetical Works*, edited by Laing (2 vols., Edinburgh, 1879), and *Works*, edited for Early English Text Society (5 parts, London, 1865–71).

LINDSAY, John Wesley (1820–1912). An American Methodist Episcopal clergyman and educator, born at Barre, Vt. He graduated from Wesleyan University in 1840 and from Union Theological Seminary in 1842. The next year he entered the Methodist ministry, joining the New England conference. He was professor of Latin and Hebrew in Wesleyan University from 1848 to 1860; from 1865 to 1868 was president of Genesee College (afterward developed into Syracuse University); for five years was professor of exegetical theology in Boston University School of Theology (later professor of New Testament Greek and exegesis); and from 1873 to 1883 was dean of the College of Liberal Arts of Boston University. He continued to work in the pastorate until 1895. He was a presiding elder for three terms; a delegate to the General Conference for the years 1864, 1868, and 1872; and, as charter member, remained on the board of education of the Methodist Episcopal church till his death (44 years). He was the author of the commentary on Deuteronomy in the Whedon series of commentaries.

LINDSAY, Nicholas Vachel (1879–). An American poet, born at Springfield, Ill. He studied at Hiram College, Ohio (1897–1900), at the Art Institute, Chicago (1900–03), and at the New York School of Art (1904–05). In the winters from 1905 to 1909 he lectured for the Y. M. C. A. and in 1909–10 for the Anti-Saloon League. He made several long tramping trips, during the first of which (1912) he walked from Illinois to New Mexico, and gained notice by paying his way with his verse, on the analogy of the troubadours and strolling players of the Middle Ages. He is author of *The Tramp's Excuse*, a poem (1909); *Rhymes to be Traded for Bread* (1912); *General William Booth Enters Heaven, and Other Poems* (1913); *The Congo, and Other Poems* (1914); *Adventures while Preaching the Gospel of Beauty* (1914).

LINDSAY, Robert. A Scottish chronicler, called, from his birthplace, Pitscottie (q.v.).

LINDSAY, Samuel McCune (1869–). An American sociologist, born at Pittsburgh, Pa. He graduated from the University of Pennsylvania in 1889; studied in 1889–94 at Berlin, Vienna, Rome, and Paris; and received the degree of Ph.D. from Halle in 1892. He was professor of sociology at the University of Pennsylvania from 1904 to 1907, when he became professor of social legislation at Columbia University. He served as special agent of the United States Finance Commission in 1892, as expert agent of the United States Industrial Commission in 1899–1900, and as commissioner of education for Porto Rico in 1902–04; and in 1901 he was president of the American Academy of Political and Social Science, of whose *Annals* he became associate editor. He is author of *Die Preisbewegung der Edelmetalle* (1893); *Social Aspects of Philadelphia Relief* (1895); *Railway Labor in the United States* (1902); *History of the Establishment of the Public School System in Porto Rico* (1905). He edited three of the annual reports of the National Child Labor Commission, New York (1904–07), and contributed to the New International Encyclopædia.

LINDSAY, Thomas Bond (1853–1909). An American linguist and educator, born in New York City. He graduated at Wesleyan University in 1874, and then studied in Germany. In 1878 he became assistant professor of Latin and Sanskrit at Boston University, and in 1884 was promoted to a full professorship. He wrote several articles on Latin poets for Warner's *Library of Best Literature;* edited Cornelius Nepos (1882 and 1895), Juvenal (1890), and Catullus (1902); and published *Easy Latin Lessons* (with Rollins, 1890) and *Sight Slips in Latin* (1892).

LINDSAY, Thomas Martin (1843–1914). A Scottish minister of the Free church. He was educated at the University of Edinburgh and was examiner there and assistant in logic and metaphysics. In the Free Church College at Glasgow he became professor of church history in 1872 and principal in 1902. For 15 years he was convener of the Free church foreign mission committee, and as such traveled in eastern Europe and western Asia. He translated Ueberweg's *Logic* (1871); contributed to the *Encyclopædia Britannica*, the *Cambridge Modern History*, the *Cambridge Medieval History*, and the *Cambridge History of English Literature*, but is better known for his publications on Luther and the Reformation, especially *Luther and the German Reformation* (1900) and the very valuable *History of the Reformation* (1906–07).

LINDSAY, Wallace M. (1858–). A distinguished Scottish Latinist, born in Fifeshire. Educated at Glasgow University, Balliol

College, Oxford, and the University of Leipzig, from 1880 to 1889 he was a fellow of Jesus College, Oxford. In 1898 he lectured at Harvard University; in 1899 he was appointed professor of humanity at St. Andrews University, Scotland; and in 1910 he was Sanders reader in paleography at Cambridge. His contributions to classical learning were chiefly in the fields of the historical grammar of the Latin language and of the study of Plautus. His publications include, besides many articles in the learned periodicals: a critical edition of Nonius Marcellus (1893); *Latin Language* (1894, the most important work on the subject in English; Ger. trans., 1895); *A Short Historical Latin Grammar* (1895); *Introduction to Latin Textual Emendation* (1896); *The Palatine Text of Plautus* (1896); *Handbook of Latin Inscriptions* (1898); *The Codex Turnebi of Plautus* (1898); *Plautus's Captivi* (2d ed., 1902); a critical edition of Martial (1902); *Nonius Marcellus' Dictionary of Republican Latin* (1901); a text edition of Plautus, the best available edition of that author (1904–05); a review of contributions to the study of Plautus, in *Bursian's Jahresbericht* (1906, 1912); *The Syntax of Plautus* (1907); a critical edition of Isidorus (1910); a critical edition of Festus (1913).

LINDSAY, William (1835–1909). An American lawyer, born in Rockbridge Co., Va. He was educated in Virginia and in 1854 removed to Hickman Co., Ky., where he taught school, studied law, and in 1858 was admitted to the bar. He served in the Confederate army during the Civil War; was elected to the Kentucky Senate in 1867; and, an associate justice after 1870, was Chief Justice of the State Supreme Court in 1876–78. He was again in the State Senate in 1889, was a commissioner of the World's Columbian Exposition in 1893, and in the same year was elected (a Democrat) to the United States Senate to fill a vacancy. In 1894 he was reëlected for the full term of six years, but, being a "sound-money" man, before the close of his term had become estranged from his party and voted generally with the Republicans. After his retirement from the Senate he practiced law in New York City. In 1901 he was appointed by President McKinley a commissioner for the Louisiana Purchase Exposition held at St. Louis in 1904.

LINDSBORG, lĭnz′bŏrg. A city in McPherson Co., Kans., 21 miles by rail south of Salina, on the Smoky Hill River and on the Union Pacific and the Missouri Pacific railroads (Map: Kansas, E 5). It is the seat of Bethany College (Lutheran), opened in 1881, consisting of 12 departments, including a musical conservatory which is widely known for its annual "Messiah" concerts. The city is the centre of several large Swedish Lutheran colonies and contains a fine high school and the Lutheran publication house for the West. It has considerable trade in flour, grain, broom corn, live stock, farm produce, etc., and manufactures flour, spark plugs, brooms, and brick. The water works and electric-light plant are owned by the city. Pop., 1900, 1279; 1910, 1939.

LINDSEY, lĭn′zĭ Ben(jamin) B(arr) (1869–). An American jurist and social reformer, born at Jackson, Tenn., Nov. 25, 1869. He was educated in the public schools of Jackson and at Notre Dame, Ind. At 18 he was left by his father's death the sole support of his mother and her three younger children. He obtained employment in a real-estate office in Denver, Colo., and occupied his leisure in reading law. In 1894 he entered upon the practice of law in Denver. He soon became identified with the movement for reform in legal procedure, and through his partner, Frederick W. Parks, elected to the Legislature in 1897, secured the passage of a law making the vote of three-fourths of a jury sufficient for a verdict. In 1900 he was appointed to a vacancy in the county court. His special preoccupation came to be the reform of the methods of dealing with children charged with delinquency or crime. Through his efforts an act was passed creating in the city of Denver a juvenile court which, though not the first to bear a similar name (see Juvenile Court), represented an important advance in the relation of the law to children. Lindsey was made judge of the juvenile court in 1901, and held this office continuously through successive two-year terms, although encountering strong opposition on the part of interests prejudiced by his activities, culminating in 1908 in a refusal by both the Republican and the Democratic parties to indorse his nomination for the office. Under his administration the juvenile court of Denver became famed throughout the civilized world, and many of its features have been copied, not only in a number of American States, but in foreign countries as well.

Among other measures to which Judge Lindsey contributed his influence were a reform of the registration law, greatly reducing election frauds; a reform of the ballot; State provision for the support of the dependents of persons serving in prison; extension of the probation system for prisoners; organization of public baths and playgrounds in Denver; and the institution of the fresh-air movement in the same city. He was a leader also in the fight against franchise exploitation of the city of Denver, and in the movement to abolish child labor. He carried on an active propaganda for the general adoption of the juvenile-court plan, and for political and social reform, through lectures delivered in many American and foreign cities and through the publication of books and pamphlets, of which *The Beast* (with Harvey J. O'Higgins, 1910) was widely circulated. It was first published as a magazine serial under the title *The Beast and the Jungle*. In 1906 Judge Lindsey was a candidate for Governor of Colorado, and in 1912 became a member of the Progressive National Committee. With Edwin Markham and George Creel he was coöauthor of *Children in Bondage* (1914) and he wrote the article "Juvenile Court" for the New International Encyclopædia. Consult Lincoln Steffens, *Upbuilders* (Garden City, N. Y., 1909).

LINDSEY, Charles (1820–1908). A Canadian author. He was born in Lincolnshire, England, and in 1841 went to Canada, where he was employed on the staff of the Toronto *Examiner* and of the Toronto *Leader*. He became a fellow of the Royal Society of Canada on its foundation in 1882. His publications include: *Clergy Reserves* (1851); *Prohibitory Liquor Laws* (1855); *The Prairies of the Western States* (1860); *Life and Times of William Lyon Mackenzie* (2 vols., 1862; new ed. by G. G. S. Lindsey, 1908); *An Investigation of the Unsettled Boundaries of Ontario* (1873); *Rome in Canada* (1878).

LINDS′LEY, John Berrien (1822–97). An

American physician and educator, born at Princeton, N. J. After graduating from the University of Nashville in 1839, and (M.D.) from the University of Pennsylvania in 1843, he studied theology and in 1846 was ordained to the Presbyterian ministry. He was professor of chemistry in the University of Nashville (1850–70), chancellor of the university (1853–73), and in 1850 assisted in organizing the medical department of the institution, becoming its first dean. He also organized Montgomery Bell Academy, and had a part in the establishment of the Tennessee College of Pharmacy, where he occupied the chair of materia medica from 1876 until his death. In the University of Tennessee he was professor of chemistry and State medicine from 1880 to 1897. For many years he edited the *Nashville Journal of Medicine and Surgery;* and he contributed to periodicals, published *Our Ruin: Its Causes and Cure* (1868), and was editor of *The Military Annals of Tennessee* (1886).

LIN′DUM. The ancient Latin name of the English city Lincoln (q.v.).

LIN′DUS. The ancient name of a city on the island of Rhodes.

LINE (AS. *line*, OF., Fr. *ligne*, It. *linea*, from Lat. *linea*, thread, line, from *linum*, Gk. *λίνον*, *linon*, flax). A military and naval term, applied to the regular regiments of artillery, cavalry, and infantry, in distinction from engineers and special corps or departments. While it applies universally, it has more special reference to the armies of the United States and Great Britain. Originally it referred to the troops constituting the regular line of battle. In England the terms *marching regiment* and *marching officer* were formerly much used, as synonymous with line regiment and line officer. *Line formation* is a formation in which the men, horses, or guns constituting the line are abreast of each other. It is the order in which infantry form their attack.

The engineer officers (see ENGINEERS, CORPS OF) are included among the staff officers, but by the Organization Act of 1899 they may take command of troops, provided they are on duty with engineer troops, as line officers. In the United States navy there is a similar usage and the line or combatant officers are distinguished from those with other duties, such as the medical corps, pay corps, etc. In European navies the term is used to distinguish the officers serving in the regular navy from those in the naval reserve or on coast guard or other duties.

LINE. A term used in the fine arts, by extension of its original meaning, as synonymous with drawing. The use of line in representation of visual objects in general is discussed under DRAWING and PERSPECTIVE; this article will confine itself to its use in painting. Line is of equal importance with color in a picture, the greatest colorists of the past, like Titian and Tintoretto, having also been good draftsmen. In fact, the character of a picture is often determined by the prevailing character of its lines, which is generally indicative of a particular sentiment of which it forms the expression. (See COMPOSITION.) It is impossible to discuss here the studio maxims and rules of drawing. There is, of course, such a thing as an abstract beauty of line. Curves strike us as being more beautiful than unvarying straight lines, and compound and reversed curves than simple ones. In like manner we feel that lines could continue each other smoothly, as in the human figure. But the following of cast-iron maxims would restrict the artist in practice, and destroy for the amateur the enjoyment of many of the most beautiful works of art.

As regards line in a picture there are two distinct points of view—the classical, or academic, and the picturesque, or naturalistic. The former sees in line the chief, almost the only, merit of a picture, relegating color to a position entirely subordinate. Its chief subject is the human figure, and it attempts by uniting many individual perceptions to reach the ideal. The picturesque, on the other hand, endeavors to give the soft outlines of nature, and is concerned rather with the general effect than with details. Its chief purpose is to give the character of objects, the appearance of life, and to do this it emphasizes salient points to the neglect of details. The character of drawing used in the portrayal of an object—whether classical or picturesque—is determined by the nature of the object, the purpose of the artist, and, above all, by his individuality.

Among ancient peoples the Greeks were very accurate draftsmen, this being one respect in which their painting at least equaled that of modern times. Among the Italians the Florentines, from Giotto to Michelangelo, were preëminent in line, though it was also the forte of the Paduan school (Mantegna). The Flemings of the fifteenth century (Van Eyck, Memling) and the Germans of the sixteenth (Dürer, Holbein) also excelled in line. The Venetians were colorists rather than draftsmen, as were also the Spaniards (Velazquez) and the Netherlanders (Rubens, Rembrandt). Classical drawing was carried to the most logical extreme by David and his followers in France, the picturesque view being represented by Delacroix and the Romanticists, whose successors in this respect, the Impressionists, practically deny the existence of line. Most artists of the present day, however, combine both points of view in their practice. Consult the authorities referred to under COLOR.

LINE, MATHEMATICAL. A magnitude of only one dimension, defined as the path of a moving point or the boundary between adjacent portions of a surface. Lines are classified as *straight*, *broken*, *curved*, or *mixed*. The broken line is composed of straight lines. A mixed line is composed of straight and curved lines. The word taken alone is generally understood to refer to a straight line.

LÍNEA, lē′nȧ-ȧ, LA. A town of Spain. See LA LÍNEA.

LIN′EAL (Lat. *linealis*, relating to a line, from *linea*, line). In law, the relationship of persons who constitute successive generations in a direct line of descent from a common ancestor. It is the direct opposite of "collateral" as applied to consanguinity or relationship, which means persons who have a common ancestor but do not bear the relation of ancestor and descendant as to each other, as cousins, who have a common ancestor on either the paternal or maternal side but have not the same immediate ancestors, that is, their parents. See COLLATERAL; CONSANGUINITY; DESCENT; RELATIONS.

LIN′EAR ACCELERATION. See MECHANICS.

LINE ENGRAVING. That in which the line is cut into copper or steel plates by means of a pointed instrument called the burin (q.v.). The design is printed in black lines from the incisions in the metal, as distinguished from wood engraving, in which the design is printed from the parts in relief. Line engraving on copper, which was the metal generally used, is also called copper or copperplate engraving. The burin is a slender steel bar, square, or less usually triangular in section, with this peculiarity, that its working end is cut off in the direction of the diagonal plane so that the most projecting point—that farthest from the handle—is a not very acute solid triangle bounded by three planes which meet in very sharp edges. This steel bar is set in a short wooden handle having a rounded form so shaped that the hand may push it strongly, point on. When this tool is forced along the surface of a metal plate with the axis of the steel bar slightly inclined to the surface of the plate, it cuts a groove, forcing out the metal in a curled shaving; and according as it is forced in more or less deep it makes the incision more or less wide. The artist having before him, let us say, a patch of shade in the drawing which he is to copy, that patch having a definite size and the depth of the shade varying in an artistic gradation from light to dark, it is his business to reproduce that shade on the paper which is to be printed from his engraved plate by means of applied ink; and therefore, as he has at his disposal only solid black lines by which to represent shade, he has to decide on the number, the direction, the fineness, and the closeness of the setting of those lines.

Some burinists have worked with very fine lines, put in as simply as those of the etcher—short lines, nearly parallel, drawn with all the apparent ease of a pen-and-ink draftsman. Others, especially the line engravers of the seventeenth and eighteenth centuries, have used lines of varying breadth, very wide in some part of their length and tapering to a point, or nearly so; and these lines have been used in one system, nearly parallel to one another, and have also been used crossing each other like the crosshatching recommended by some teachers of drawing in black and white. A still further development of the process has involved the putting of a dot or cut in the metal in each lozenge-shaped space left by such crosshatching; but this has not been approved by the critics of later times and may be thought to be abandoned. Line engraving has not been in very common use since the middle of the nineteenth century, and this, in part, because of the strong feeling caused by the use of etching and dry-point work by artists to render their own thoughts, with the result that line engraving, a process much too slow and mechanical to please the artist who is accustomed to painting or drawing in monochrome, is neglected except for the reproduction of paintings and the like. The very common use of line engraving to do just such work as that, viz., the close copying of pictures and statues in the public galleries of Europe, has aided in this general condemnation of burin work as dull and uninteresting. The production, since 1850, of a few works of the burin in which great artistic intelligence and much originality are shown has not sufficed to restore the popularity of the art. Moreover, the immense advance in photographic engraving of all sorts has helped in the comparative abandonment of this with the other uses of the engraver's art.

History. As stated in the article ENGRAVING, the custom of printing trial impressions of niello plates may have originated the art of engraving for printing upon paper. This origin must have taken place in the course of the fifteenth century, and the result of the newly invented process is found in such early work as that ascribed to Baccio Baldini. Such prints are, of course, rare, but they do not need rarity to make them singularly valuable, both historically and in the way of artistic merit. Contemporary with them are a great many small prints, known to collectors as *niello* or niello prints, these being evidently made by rubbing with ink the coppers prepared for niello work and taking impressions on paper to show the design. From 1450 until the close of the century these works and those of Robetta of Florence, those of Lombardy, and those of Schongauer and others in Germany, represent a great part of the artistic movement of the time. In Germany the rôle played by engraving was especially important, since it dominated rather than was influenced by painting. The earliest engravings, whether of Italian or German origin, show a very imperfect knowledge of the power of the burin and the resources of the burinist's art. The outline is drawn on the metal with singular grace and charm, this extending even to the most refined qualities of facial expression; but this outline is not supported by a complete system of light and shade. The burin is used for thin and light lines only, without imitation of pen or pencil drawing. The early Italians conceived the shading as distinct from the outline, rendering it by means of straight lines. But the Germans shaded more skillfully, letting the shadow follow the forms of the objects and making use of curved lines for the shadow, a method adopted later by the Italians. The work of Jacopo dei Barbari (the master of the caduceus), an artist of whom little is known, is among the most poetical of the time, and Sandro Botticelli, in his designs for the illustration of Dante—designs thought to have been engraved by Baccio Baldini—is supposed also to have engraved a few plates himself. In fact, the painters of the time experimented with the burin very nearly as the painters of the second half of the nineteenth century worked with the etching needle. The best of the engravers in the early Italian manner, both in power of line and skill in shading, was the painter Andrea Mantegna. By far the most important figure in early German engraving was Martin Schongauer (died 1488), who used the burin with great power and freedom and excelled all before him in shading. It is important to note that the early engravers had no thought of the comparative lowering of their art to a process of mere copying.

The sixteenth century is a time of amazing fertility and artistic results in line engraving. Especially during the years previous to his death in 1528, Albrecht Dürer (q.v.) achieved greater delicacy and skill in shading and an unequaled facility and power in the use of the burin, producing designs of extraordinary originality and refined sentiment. His most famous pieces are the "Melancholia" and the so-called "The Knight, Death and the Devil" and "St. Jerome in his Study"; but his "Adam and Eve," the noble designs called the "Coat of Arms with the Skull" and the "Coat of Arms with the Cock," and several of the portraits, are of equal artistic importance. (For details, see DÜRER, ALBRECHT.) In the Low Countries Lucas van Leyden worked until 1533, and his prints, though not possessing the magnificent strength of those of Dürer, are yet charming for their quaintness; and his portrait work has singular attractiveness because of its apparent fidelity to individual expression and to details of costume. Barthel Beham produced less work than his predecessor and probable teacher, Dürer, his life being short, but he is known as the maker of the finest burin engraving existing if technical qualities are considered, and one equal to any similar artistic work of the kind, viz., portraiture, in loftier expressional qualities. This astonishing print is the portrait of the Emperor Charles V in his youth, the plate being dated 1531. Marcantonio Raimondi (q.v.) has been the most reputed and admired of burin engravers, but this largely because of the traditional dependence of his art upon the teachings of Raphael, and the fact that he reproduced many of Raphael's drawings, now lost—these reproductions being not necessarily close, though having much of the original significance. In a curious way Marcantonio links together the earliest and the later schools of line engraving; for he has a refinement of outline in no way supported by his system of light and shade, in which he resembles the earliest men, while his deliberate preference of a life of copying to the career of an original designer in black and white makes him in a way the founder of that unfortunate later school which looked upon line engraving as a technicality, to be used only for the rendering, usually inadequate, of important pictures. Agostino Carracci (q.v.) worked during the second half of the sixteenth century, producing original designs as well as copies, and in France the able workmen Abraham Bosse and Israel Silvestre carried the traditions of originality and native force far into the seventeenth century. Poetical inspiration was denied them, but they have left an admirable record of their time in designs of complete individuality. The most important factor in line engraving of the seventeenth century was the group of engravers employed by Rubens to reproduce his paintings, of whom the most important were Vorstermann, Paul Pontius, and the brothers Van Bolswert. They substituted modeling for the meagre Italian outlines, broad masses for the detailed treatment of German work, and adopted a new system of light and shadow.

During the reign of Louis XIV France was at the head of Europe in the art of engraving and was represented by Robert Nanteuil (q.v.), Gérard Edelinck, a Fleming, who had migrated to Paris, and Antoine Masson, who worked after paintings by the great artists of the day, but without a minute adherence to the original. Nanteuil was indeed the inventor of those devices, those combinations of lines and dots and that excess of crosshatching, which were so abused by his successors; but his own work is of almost uniform good taste and dignity—formal, indeed, in the spirit of the time, but retaining a force and fire characteristic rather of the original work than of the copyist. Jean Pesne engraved the paintings of Poussin with a similar boldness, transferring the artist's composition from the canvas to the smaller study in black and white. Gérard Audran (died, 1703) was able to give power to huge prints, rather closely studied from the paintings of his contemporaries, Mignard and Poussin, as well as to reproductions of Raphael's wall pieces.

In the eighteenth century line engraving is delicate and refined and the portraits of the time are of singular interest. but it is devoted to a more feeble system of design and largely used for book illustration. The celebrated *Livres à vignettes*, illustrated by Charles Eisen, Charles Nicolas Cochin, Pierre Philippe Choffard, and Nicolas de Launay, as the most celebrated of a large school of engravers, form a separate branch of art study, the number of the works being very great and their merit singularly uniform. In still later times, Volpato (died, 1803) and Raphael Morghen (died, 1833) carried over the assumed grand style of the earlier workmen into the nineteenth century; and with their works closes the history of line engraving of the traditional school. The nineteenth century saw the final collapse of line engraving in favor of cheaper and more rapid processes. Along certain lines progress was indeed made—in local color, light and shade, and textures. In France a few powerful and self-centred artists like François Forster (died, 1892) and Henriquel-Dupont (died, 1892) followed a resolute course, working in the spirit of such a period or such a master of the past as their personal characteristics made easy, and producing valued prints. Since 1850 line engraving has been kept alive mainly by the government institution, La Chalcographie du Louvre. There have been but few exceptional artists, like Ferdinand Gaillard, to glorify the second half of the nineteenth century. In Great Britain the art was greatly fostered by the commercial enterprises of John Boydell (q.v.), who endeavored to establish a national art. Mixed processes, in which line engraving was used for finishing, may be especially seen in the wonderful work after Turner. In Germany good line engraving, even in its older form, retained great popularity. Good work has been produced as well in the old manner as in the subtle mixed processes like those of Stauffer-Bern. In the United States, line engraving, although practiced in a primitive fashion in New England and other colonies, and not a little used in the nineteenth century for illustration, never attained the importance of an independent art.

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Consult the bibliographies of ENGRAVING; ETCHING; PRINT.

LINEN (Fr. *lin*, Ger. *Leinen*, Lat. *linum*). Yarn, thread, or cloth made from flax (q.v.). Also, a general term for tablecloths and napkins (table linen), sheets and pillow cases (bed linen), shirts, handkerchiefs, and collars (body linen), whether of all linen, part linen and part cotton, or all cotton. Linen thread is used almost exclusively in the manufacture of handmade laces. (See Lace.) Table linen is made almost exclusively in damask weave. (See Damask.) While we owe the early development of silk to China and of cotton to India, the mother country of linen is Egypt. Flax is indigenous to the valley of the Nile, and Egyptian graves from 2000 to 4000 years old have preserved for us linen tapestries, embroideries, and plain cloths, many of them of a texture almost incredibly fine. The Bible often mentions flax in Egypt and tells us that Pharaoh arrayed Joseph in vestures of fine linen (about 1700 B.C.). For centuries the Phœnicians transported linen cloths from Egypt to all parts of the Mediterranean world. Linen has from time immemorial been symbolic of purity, and purple and fine linen of royalty. This is because linen can be bleached to snowy whiteness, and on account of its resistance to coloring matter does not stain easily, the long fibres having few short ends to become fuzzy like cotton. The fact that linen absorbs water rapidly makes it the best material for towels; its hard, smooth, lustrous surface renders it unsurpassed for table use; and it is cool for summer wear, because a splendid conductor of heat. But the difficulty of dyeing it usually gives the preference to cotton, silk, or wool when color is desirable. The stiffness that causes it to lie flat and smooth on a table or around the wrist or neck makes it undesirable for clothing generally, because it retains wrinkles obstinately.

As everybody knows, the United States is primarily a cotton country. (See Cotton.) On this side of the Atlantic linen is to be classed with silk as an article of luxury. In the words of the United States census for 1904: "The linen manufacture is exotic in this country. Relatively little attention is given to the preparation of the flax fibre for manufacture, and that which is prepared is adapted only to the cheapest processes. Imported material is employed almost exclusively in the spinning of yarns and the weaving of fabrics. There has never been a successful attempt to produce fine goods at a profit." The total production of linen goods, consisting mostly of thread, twine, and toweling, was only $6,385,218 in 1909, as compared with $4,368,159 in 1899 and $2,880,341 in 1889.

In Ireland the situation is quite different. Moore says, in the introduction to his book on *Linen:* "Cotton may have its probable limitation with regard to its users, but linen is universal and cosmopolitan, being found in some form or other alike in the cottage of the labourer and in the palace of the sovereign." While this is an exaggeration, it sounds natural from the mouth of a Belfast man, because Belfast is the centre of the Irish linen trade and is famous throughout the world as Linenopolis. The value of the linen exports from the United Kingdom in 1913 was £8,247,571 (about $40,000,000), of which Ireland contributed four-fifths and Scotland most of the rest. Of these exports the United States takes about one-half, handkerchiefs alone amounting in 1913 to $2,067,000. That the manufacture of fine linens is likely to be transplanted to the United States as a result of the war in Europe is improbable. The amount of hand labor necessary in the preparation of the flax for spinning, and in the spinning and weaving, is prohibitive. But it is probable that the important linen and lace industries of Belgium will seek at least a temporary refuge elsewhere—in France, Holland, Scotland, or Ireland.

Spinning, Bleaching, and Weaving. After the flax plant has passed through the processes of retting, grassing, and scutching, it is ready for the spinning mill. Here there are repeated combings and cleanings to remove impurities, followed by hackling to separate the fibres, and drawing to produce roving ready to be spun. The best flax spinning is done in a moist atmosphere; indeed, the finest yarns can be spun only when wet. The hand spinner of olden time kept a bowl of water beside her, in which she moistened her fingers as she spun. Linen is more difficult to weave than cotton because less elastic, and liable to break under sudden strain. For a long time after the introduction of power looms fine damasks continued to be woven by hand. Now hand weaving is confined in Ireland to small quantities of the very finest napkins, doilies, and small tablecloths; but coarse crashes and many of the cruder varieties of European linens are woven on hand looms by the peasants of remote villages. Linen bleaching is a most elaborate procedure. Mrs. Earle, in her *Home Life in Colonial Days* (New York, 1900), says that the American colonists put linen through some 40 processes of wetting, washing, acid bleaching, rinsing, soaking, grass bleaching, etc., before attaining pure white. These processes required many weeks. Linen loses from 25 to 30 per cent of its weight in bleaching and is much more weakened by modern chemical than by the ancient grass methods. The modern half bleach is obtained by boiling the linen in sodium carbonate or in soda ash; then treating with bleaching powder, then with dilute sulphuric acid. After each operation it is thoroughly washed. For a three-fourths bleach the cloth is then spread on the grass, and sun and air do their work. For a full bleach (pure white) all of these processes are several times repeated. See Bleaching.

One easy way to tell linen from cotton is to set one of the threads on fire. If it is cotton, it will blaze up and continue to burn. If it is linen, it will smolder. Another and even simpler way, and one commonly practiced by purchasers in shops, is to wet the finger in the mouth and place it under the cloth. If the moisture comes quickly through, the cloth is linen.

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LINEN CHEST. See Furniture.

LINEN WEDDING. See Wedding Anniversaries.

LINE OF DEMARCATION. See Demarcation, Line of.

LINE OF SIGHT. The straight line passing through the sights of the piece; at the instant of firing this line passes through the target. The direction of the axis of the bore when the projectile leaves the muzzle is called the *line of departure.* See Ballistics.

LINES OF FORCE, Electric. See Electricity.

LINES OF FORCE, Magnetic. See Magnetism.

LING (MDutch *linghe*, *lenghe*, Dutch *leng*, Ger. *Länge*, *Leng*, ling, from AS. *lang*, Goth. *laggs*, OHG., Ger. *lang;* connected with Lat. *longus*, OChurch Slav. *dlŭgŭ*, Lith. *ìlgas*, OPers. *drānga*, Skt. *dīrgha*, long). An important species of cod, *Molva molva*, abundant throughout the northern European seas and in value almost rivaling the cod. In form it is much more elongated than the cod, has two dorsal fins and one anal fin, and has a barbel at the extremity of the lower jaw. The ling is generally 3 or 4 feet long, sometimes more, and has been known to weigh 70 pounds. The color is gray, inclining to olive; the belly, silvery; the fins edged with white. The ling is a very voracious fish, feeding chiefly on smaller fishes. It is also very prolific and deposits its spawn in June, in soft oozy ground near the mouths of rivers. It is found chiefly where the bottom of the sea is rocky. Great numbers are caught in the same manner as cod, by hand lines and long lines, and are sent to the markets in the form of stockfish.

In the United States the fresh-water cod (*Lota maculosa*) is known about Lake Ontario by this name. See Burbot; Cultus Cod.

LING. A plant of the genus *Erica;* also applied to heather, *calluna vulgaris.* See Heath.

LING, Pehr Henrik (1776–1839). A Swedish dramatist and poet, and originator of the Swedish form of military, medical, and school gymnastics. He was the son of a country clergyman settled at Ljunga in Småland. After studying at Vexiö he spent a year at the University of Lund; seems to have been a clerk and tutor in modern languages in and near Stockholm for five years; from 1799 to 1804 he prosecuted linguistic and literary studies in the university and royal library at Copenhagen, acquiring a lifelong interest in the old Norse mythology and sagas. Here he also mastered the art of fencing, under two French teachers, and through visits to Nachtegall's private gymnasium was introduced to the Guts-Muths gymnastics. In 1804–12 he was fencing master at the University of Lund and during this period elaborated his original system of bayonet fencing and gymnastics and also published the first of his dramatic works. In 1813 he proposed to the state authorities the founding of a national training school at Stockholm from which all Sweden should be supplied with teachers of gymnastics. The King approved the plan, made Ling director at a fixed salary, and in 1814 the Royal Central Institute of Gymnastics was accordingly opened. In this he labored for the rest of his life and meanwhile published the long series of dramatic and other poetical works which won for him membership in the Swedish Academy, the title of professor, and decoration with the Order of the North Star. Ling attempted to give to gymnastics a scientific basis, and under his successors at the Central Institute the art has been developed along the three lines which he had in mind at the start, i.e., as an agent in training men for the army and navy, as a therapeutic measure, and as an integral factor in school life. His *Asarne* (1816, 1834) includes the entire mythology and ancient legendary history of the Scandinavian race, and in his numerous dramas he sought to portray momentous epochs in Swedish history.—Hjalmar Fredrik Ling (1820–86), his son, educated under private teachers, at the Central Institute, and in Paris, was installed as teacher in the Central Institute in 1843, and from 1858 to 1882 was head teacher in the section of school gymnastics. This side of his father's system he developed with great ability. He made nearly 2000 pen drawings of gymnastic positions and movements, about 500 of which appear in a book published in 1893.

LINGA, lĭṉ′gȧ (Skt., symbol). In the sectarian worship of the Hindus, the phallic emblem of the generative power of nature. The Linga worship prevails with the Saivas, or adorers of Siva. The manner in which the Linga is represented is generally inoffensive—the pistil of a flower, a pillar of stone, or other erect and cylindrical objects, being held as appropriate symbols of the generative power of Siva. Its counterpart is the *Yōni*, or the symbol of female nature as fructified and productive. The Linga is the sectarian badge of the Lingayats or Lingaits of South India. Consult Sir R. G. Bhandarkar, *Vaisnavism, Saivism, and Minor Religious Systems* (Strassburg, 1913). See Hinduism; Phallicism.

LINGAH, lĭn-gä′. A seaport of Persia, the second in importance, situated in the Province of Laristan, on the Persian Gulf, just west of the Strait of Ormuz and about 300 miles southeast by sea from Abushire (Map: Persia, F 9). It has an important bazar. There is an extensive transit trade, the main item being pearls, which pass through Lingah on the way from the Arabian fisheries to India. Other articles in its trade are rice, gold, and cotton stuffs. Lingah has regular steam communication with British India and has a British post office. Pop. (est.), 15,000, including a large number of Arabs. Arabs held the port until 1898, when Persian troops took possession.

LINGARD, lĭṉ′gärd, John (1771–1851). An English historian. He was born of humble parentage at Winchester, Feb. 5, 1771, and, being destined for the priesthood, was sent to the English college of Douay in France, where he remained until that college, in common with most of the religious establishments of France, was broken up by the disorders of the Revolution. On his return to England in 1793 he became tutor in the family of Lord Stourton. The act called the Catholic Relief Act having enabled Catholics to open schools in England, the Douay community was transferred to Crook Hall and ultimately to Ushaw, near Durham. In 1794 Lingard rejoined his companions at Crook Hall, where, after entering the priesthood, he continued as professor of philosophy, prefect of studies, and vice president until 1811, when he accepted the humble cure of Hornby, near Lancaster, which he continued to fill until his death (July 17, 1851). Lingard's first important work was the *Antiquity of the Anglo-Saxon Church* (1806; reprinted in 1810, and afterward in a much enlarged ed. of 2 vols., 1845). This was but the pioneer of what eventually became the labor of his life, his *History of England until 1688*, in eight quarto volumes (London, 1819–

30). Before his death it had passed through six editions, frequently revised, the last of which, in 10 volumes, appeared in 1854–55. From its first appearance it attracted much attention, being founded on a careful study of the original sources. Although written in a conciliatory spirit, it was criticized with considerable asperity in its polemical bearings; but the author in his replies displayed so much erudition and such careful consideration of the original authorities that the result was to add materially to his reputation as a scholar. He was the recipient of many honors in recognition of his services, among others of a pension of £300 from the crown. Consult Gardiner and Mullinger, *Introduction to the Study of English History* (London, 1881), and Haile and Bonney, *Life and Letters of John Lingard* (ib., 1911).

LINGAYÉN, lēn′gȧ-yān′. The capital of the Province of Pangasinán, Luzon, Philippines (Map: Philippine Islands, C 2). It is situated at the head of the Gulf of Lingayén, on a low and fertile alluvial island in the delta of the Río Agno, 8 miles west of Dagupan. It has many substantial stone houses, a handsome church, a post office and telegraph station. It is an important trade centre, and, through the station at Dagupan, is connected by rail with Manila. It was founded at the end of the sixteenth century by the Augustine fathers, who in 1611 retired in favor of the Dominicans. Pop., 1903, 21,529.

LINGAYÉN, Gulf of. A large bay or gulf of the China Sea indenting the west coast of north Luzon, Philippines (Map: Philippine Islands, C 2). It is 20 miles wide at the entrance between Santiago Island on the west and Point San Fernando on the east; it extends inland about 30 miles. It is exposed to squalls and typhoons, the latter especially in September and October. The east shore is bordered by high mountains; the south is low and consists of the large delta of the Agno River. The largest islands are Santiago and Cabarruyán. The principal ports on the gulf are St. Thomas on the east, Lingayén and Port Sual on the south, and Port Bolinao on the west.

LINGELBACH, lĭng′el-bäG, Jan (1622–74). A Dutch genre and landscape painter, born at Frankfort-on-the-Main. He went to Amsterdam in 1637, was in Paris in 1642, and, having pursued his studies in Rome from 1644 till 1650, settled at Amsterdam. There his style was greatly influenced by Wynants, in whose landscapes he often supplied figures and animals, and by Wouverman, whose pupil he probably was, and whom he successfully imitated. He also inserted figures in the landscapes of Hobbema, Koninck, and others. He painted Italian seaports, landscapes, hunts, fairs, and other genre scenes, in a cool and often delicate silvery tone, and ranks high for skill in composition, good drawing, and careful execution. His pictures are to be found in almost every gallery of Europe. One of his principal works is the "View of the Dam and New Town Hall" (1656), in the City Hall at Amsterdam, noteworthy for the individual character of the numerous figures and the fine effect of the fresh morning light. In Amsterdam Museum are a rich "Italian Harbor" (1664) and a "Riding School," in which he rivals Wouverman. The "Seaport in Asia Minor" (1670) in The Hague Museum and a "Vegetable Market" (1670) and "Seaport" in the Louvre are remarkable for a warmth of coloring quite unusual in this painter. The Metropolitan Museum, New York, possesses a "Battle Scene" and "Dance of Peasants."

LINGENTHAL, lĭng′en-täl, Zachariä von. See Zachariä von Lingenthal.

LINGG, lĭng, Hermann von (1820–1905). A German dramatist and poet, born at Lindau. He was educated as a military surgeon. His *Poems* (1853) are of great elegiac originality and remarkable for their imagery. He was the best epic poet of the Munich school. His greatest power appeared in his epic *Völkerwanderung* (3 books, 1866–68). He wrote also *Vaterländische Balladen* (1869) and other volumes of verse, the dramatic poem *Die Walkyren* (1864; 2d ed., 1865), the tragedy *Catilina* (1864), and other dramas. His latest poems are: *Jahresringe, Neue Gedichte* (1899); *Meine Lebensreise* (1899); *Schlussrhythmen und Neueste Gedichte* (1902). Selected poems, edited by Paul Heyse, appeared in 1905 (Stuttgart). Consult: Rupert Kreller, *Die Völkerwanderung von Hermann Lingg und das Gesetz der epischen Einheit* (Munich, 1900); Arnulf Sonntag, *H. Lingg als Lyriker* (ib., 1908); Frieda Pont, *H. Linggs Biographie* (ib., 1912).

LINGONES, lĭn′gȯ-nēz. See Langres.

LINGUA FRANCA, lĭṉ′gwȧ frăṉ′kȧ. The common language spoken in the Mediterranean countries by sailors, traders, and soldiers, in dealing with natives of different nationalities, especially with Arabs, Turks, and Africans; similar thus to the pidgin English and pidgin Japanese of the Orient, the Creole dialects of Guiana, the Malay of Polynesia, the African Suhali, the Chinook of the Columbia River valley, etc., all of which, under the influence of the other meaning of *franca*, free, are sometimes called *lingue franche*. The term originated in the name *franc*, 'French,' used by the Arabs to designate the Crusaders and hence any Latin Christian (the Byzantine Christians were called *rums*). The predominance of Venice and Genoa in the Levant came to make the Italian the *franc* par excellence, and in fact the lingua franca of the Levantine Mediterranean has a predominant Italian base, with an admixture of Arabic, Greek, and African elements, and more rarely of French, Spanish, and Portuguese. In Tunis and Algeria, French, especially in recent years, has been important in contributing a large vocabulary to the lingua franca, as has Spanish in Morocco and southern Spain; but even in these regions Italian shows great tenacity. The characteristics most prominent in the lingua franca are, as regards syntax, the reduction of all verb forms to the infinitive for present and future tenses and imperatives and to the past participle for past tenses; of all pronouns to the objective case, of all nouns to one number (either singular or plural): *ti stare bona genti*, 'you are a good fellow.' The objective case is often represented, as in Portuguese, by the preposition *per*, 'for': *mi amar per ti*, 'I like you.' As regards vocabulary, the substitution of picturesque words for the less expressive (*cunciare*, 'to fix,' has become almost universal for *fazir*, 'to do'; so *massar il fogo*, 'to kill, put out, the fire') and the alteration of Romance words by giving them the meaning of words of similar sound in some other language: e.g., *fantasia*, 'fancy, imagination,' has come, under Arabic pressure, to mean 'conceit, boastfulness'; *no pigliar fantasia*, 'don't get impudent,' and the Italian *giandussa*, 'boil,' to mean 'plague': *Saint Jean venir, gandouf andar*, 'St. John comes, the plague goes.'

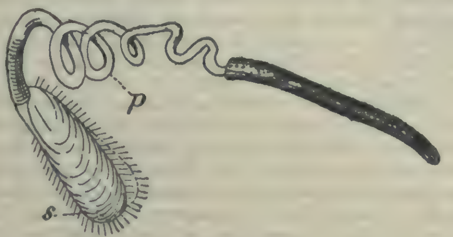
The earliest mention of the lingua franca occurs in Venetian trading documents of the eleventh century. Of the thirteenth century is an Italian poem in dialogue between an Italian and a native girl of the Gerba Islands, the latter using the lingua franca, which is playfully satirized by the poet. In the sixteenth century Levantine characters were frequently introduced in the Italian comedy, as in the *Cingana* of Giancarli di Rovigo (1560), and they were made to speak this humorous dialect. Such types occur in the Spanish plays of Lope de Vega, Acevedo, Guevara, and Calderón. From the improvised *Commedia dell' arte*, as well as from his acquaintance with Levantines in Venice, Carlo Goldoni conceived his delightful *Impresario delle Smirne;* though perhaps the most famous examples of the lingua franca on the stage are furnished by Molière's *Bourgeois gentilhomme*. Extensive specimens of the Spanish variety of lingua franca occur in Haedo, *Topografia é historia general de Argel* (Valladolid, 1612); of the French in the *Dictionnaire de la langue franque* (Marseilles, 1830), published by the French government for soldiers. Consult Hugo Schuchardt, "Die lingua franca," in *Zeitschrift für romanische Philologie* (Halle, 1909).

LIN′GUAGLOS′SA. A town of Sicily, in the Province of Catania, on the northeast slope of Mount Etna, 1725 feet above the sea and 37 miles from Messina. Remains of the lava flow from the eruption of 1566 are to be seen here. It has several interesting churches and a small theatre. It is on the edge of a rich and densely peopled agricultural region. Pop. (commune), 1901, 13,121; 1911, 12,653.

LINGUET, lăɴ′gȧ′, Simon Nicolas Henri (1736–94). A French publicist, born at Rheims. After traveling through Poland and Spain, he went to England, where he began to publish in London his *Annales politiques*, which under various changes of name he edited from 1777 to 1792 in Switzerland, Brussels, and again in London. For a time it received the support of the Austrian government, as Linguet advocated many of the Emperor Joseph's reforms. He returned to France in 1780 and was confined in the Bastille for two years for his virulent attack on the Duc de Duras. While in prison he wrote his *Mémoires sur la Bastille* (1783). After this he went to Brussels and remained there until the Revolution was almost over. But he returned too soon (1791) and, on the trumped-up charge of having "flattered the despots of London and Vienna," was guillotined in 1794. Consult Jean Cruppi, *Un avocat journaliste au XVIII siècle* (Paris, 1895).

LINGUIS′TICS. See Philology.

LIN′GULA (Lat., little tongue). A group of brachiopods, characterized by the possession of a shell, the valves of which are not hinged, but are connected by muscles, which open and close them by a more or less lateral movement; an oval opening is present near the anterior end of the animal; there is a long, fleshy stalk, which passes out from the rear between the valves of the shell. These brachiopods live in the seas of warm climates, particularly of the Indian Archipelago and Polynesia. An American species (*Glottidea pyramidata*) is common in Chesapeake Bay and off the coast of North Carolina. It has a shell about 1 inch long and ½ inch wide; the stalk is 2 or 3 inches long. The valves of the shell are brown, very flat, thin, and horny. The outer end is broad, while the other end is much narrowed; the stalk comes from between the narrow ends. The living species of lingula occur only in rather deep water on muddy or sandy bottoms. Only seven or eight species are known to be living now. The genus *Lingula* has long been considered as the oldest-known living organism, its shells having been found in all geological formations from those of late Cambrian to those of Pliocene time. The genus *Lingulella* flourished in the early Cambrian period. The species that occur in rocks of Ordovician age differ only slightly from the modern ones.



LINGULA.

A modern lingula: *s*, shell; *p*, peduncle or stalk, terminating in a tube of agglutinated sand grains.

LINIERS Y BRÉMONT, lē-nyĕrs′ ē brā′-mônt, Santiago Antonio María de (1756–1810). A Spanish naval officer and administrator, born of French parentage at Niort, Deux-Sèvres. His name was originally Jacques Antoine Marie Deliniers-Brémont. His father was a Loyalist sailor, and after the Revolution he entered the Spanish navy and had already had a varied and brilliant career before he was sent to the Río de la Plata in 1788. He fought against the English under Admiral Beresford at Montevideo in 1806 and at the head of a small fleet forced Buenos Aires to surrender in 1807. The English now marched upon Buenos Aires, and a desperate fight occurred before the city. After making great havoc in the enemy's lines, Liniers retired into the city and defended it so successfully that the English finally evacuated the valley of the Río de la Plata. For this service he was made chief of squadron, Viceroy, Governor, and Captain General of the provinces of the Río de la Plata. In 1808 he proclaimed Ferdinand VII and refused to obey the orders to proclaim Joseph Bonaparte. Thereupon, because of his foreign birth, he was requested to leave the country. Desirous of peace and recognizing that his foreign birth placed him under suspicion (despite his refusal to proclaim Joseph Bonaparte), he asked the Spanish government to replace him as Viceroy; and upon the arrival of Baltasar Hidalgo de Cisneros in 1809, issued a proclamation pointing out the qualifications of the new Viceroy and asking loyal support for him. The revolution that promptly followed these events forced Liniers to take up arms again for the Royalists. He raised a small army and marched on Buenos Aires, but he was captured by the revolutionists and executed with several of his followers.

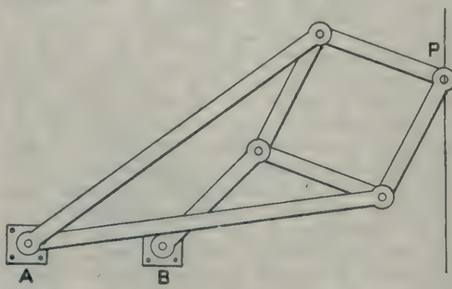
LINIEVITCH, lēn-yĕ′vich, Nikolai Petrovitch (c.1838–1908). A Russian general, born in the Government of Chernigov, where, too, he was educated. He entered military service at 17, served in the Caucasus at the age of 21, fought in the Russo-Turkish War and in the Turkestan campaigns, was made major general in 1891, and in August of 1900 assumed command of the Russian detachment with the allied forces at Pekin. For a time in 1904 he was Governor General of the Amur Province, later commanded at Vladivostok, and in November of 1904 became commander of the First Army under General Kuropatkin. After the battle of Mukden (March, 1905) he succeeded Kuropatkin as commander in chief of the Russian land forces in the East. See RUSSO-JAPANESE WAR.

LIN′IMENT (Lat. *linimentum*, from *linire*, to smear). A fluid preparation for external application, generally having soap or some fatty substance as a basis. A liniment is physically an ointment having the consistence of oil; chemically a soap, i.e., a compound of oil and an alkali. In consequence of their slighter consistence liniments are rubbed into the skin more readily than ointments. Among the most important of them are *liniment of ammonia*, which is prepared by mixing and shaking together spirits of ammonia and olive oil and is employed as an external stimulant and rubefacient to relieve neuralgia and rheumatic pains, sore throat, etc.; *soap liniment*, or *opodeldoc*, the constituents of which are soap, camphor, and spirits of rosemary, and which is used in sprains, bruises, rheumatism, etc.; *liniment of lime*, or *carron oil*, which is prepared by mixing and shaking together equal measures of olive or linseed oil and limewater (it is a soothing though very dirty application to burns and scalds, and from its general employment for this purpose at the Carron Iron Works, England, has derived its popular name); *camphor liniment*, consisting of camphor dissolved in olive oil, which is used in sprains, bruises, and glandular enlargements. Other liniments mentioned in the United States Pharmacopœia are the liniments of belladonna, cantharides, chloroform, subacetate of lead, mustard, and turpentine, or *Kentish ointment*.

LI′NIN (from Lat. *linum*, flax). The threadlike network which forms the framework of the nucleus (q.v.). This network does not take stains, and along it there are distributed stainable chromatin granules.

LINK, HEINRICH FRIEDRICH (1767–1850). A German botanist, born in Hildesheim. He studied medicine and natural science in Göttingen and in 1792 became professor of chemistry, zoölogy, and botany at the University of Rostock. He visited Portugal in 1797 in company with Hoffmansegg, and in 1811 he became professor of chemistry and botany at Breslau. In 1815 he became professor of natural history and the director of the Botanical Gardens in Berlin. His works include: *Elementa Philosophiæ Botanicæ* (1824; 2d ed., 1837); *Das Altertum und der Uebergang zur neuern Zeit* (1842); *Anatomisch-botanische Abbildungen zur Erläuterung der Grundlehren der Kräuterkunde* (1837–42); *Ausgewählte anatomisch-botanische Abbildungen* (1839–42); *Anatomie der Pflanzen in Abbildungen* (1843–47). As a result of his journey to Portugal, he compiled, with Hoffmansegg, *Flore portugaise* (1809–40).

LIN′KAGES (from *link*, AS. *hlence*, Swed. *länk*, Norw. *lænk*, link; connected with OHG. *hlanca*, *lanca*, provincial Eng. *lank*, groin, and probably with AS. *hlanc*, Eng. *lank*, slim). A system of segments or links pivoted together and capable of moving so as to describe various curves; e.g., Watt's parallel motion (1784) employed in beam engines is a case of a link motion in which the outer extremities of the end links are fixed and the mid point of the middle link approximately describes a straight line. Roberts and Tchebichev improved Watt's instrument by varying the form of the links, but Peaucellier (1864) was the first to produce an ideally straight line. His linkage known as Peaucellier's cell consists of seven links as shown in the figure. *A*, *B*, are the fixed points, and *P* is the tracer which moves in a straight line. This achievement is not only of interest to the mathematician, but is of great use to the engineer in securing parallel motion. Sylvester invented the *plagiograph*, or skew pantagraph, which not only reproduces a drawing to a desired scale, but turns it through any desired angle. Hart's contraparallelogram and Kempe's angle trisector are other important linkages. Consult Kempe, *How to Draw a Straight Line* (London, 1877). For the mathematical theory of linkages, consult "Sur les systèmes de tiges articulées," in *Nouvelles Annales*, pp. 520–560 (1875).



LINKÖPING, lȇn′kjẽ′pĭng. An episcopal city of Sweden, capital of the Lăn of Ostergötland, situated on the Stångå, which here flows into Lake Roxen, 110 miles southwest of Stockholm (Map: Sweden, F 7). It is regularly built, with fine parks and public squares; its cathedral, begun in 1150 and restored between 1871 and 1882, is one of the most beautiful in Sweden. The sixteenth-century castle, recently restored, is the residence of the governor of the province. It also possesses one of the largest libraries in the country, and several higher educational institutions. The town manufactures chiefly tobacco. Pop., 1901, 14,552; in 1912, 23,613. Linköping has been an important town since the early Middle Ages. In 1598 it was the scene of the defeat of the Catholic forces of Sigismund of Poland by his uncle, later Charles IX, and the city was the scene of the terrible vengeance exacted by the victors, known in Swedish history as the "Linköping Blood Bath."

LINLEY, lĭn′lĭ, THOMAS (1732–95). An English composer, born at Wells. Upon finishing his studies he settled in Bath, teaching music and giving concerts, at which the principal attraction was the singing of his two daughters. Later he removed to London. The success of Sheridan's *The Duenna* in 1775 was largely due to the music of Linley, and the following year the two formed a partnership and purchased an interest in the Drury Lane Theatre, Linley having direction of the musical interests, which position he held for 12 years. He was also a well-known composer of ballads and madrigals. His death occurred in London.

LINLITHGOW, lĭn-lĭth′gō, or West Lothian. A county in the southeast division of Scotland, bounded north by the Firth of Forth, and having the counties of Mid-Lothian, Lanark, and Stirling on the east, south, and west, respectively (Map: Scotland, E 4). Its area is 120 square miles. Agriculture is in a very advanced state, oats, barley, and wheat being the chief crops. The minerals are of considerable value, and there are several collieries in profitable operation. There are several flourishing ironworks and blast furnaces, fire clay and shale oil are worked, and there is a considerable quarrying industry. There are two royal burghs—Linlithgow, the county town, and Queensferry. Pop., 1801, 17,850; 1901, 65,700; 1911, 79,456.

LINLITHGOW. The capital of Linlithgow County, Scotland, 16 miles west of Edinburgh (Map: Scotland, E 4). It is one of the oldest towns in Scotland and has the parish church of St. Michael's, a beautiful specimen of late Scottish Gothic, adjoining Linlithgow Palace. The palace, strikingly situated on an eminence, was a residence of the Scottish monarchs, and the birthplace of Mary, Queen of Scots, and of her father, James V. The earliest record of its existence is of the time of David I (1124–53), and fragments of various ages are easily detected. Linlithgow was conspicuous in the history of Scotland, and here the Regent Murray was murdered in 1570. Linlithgow owes much to the Knights Templar, whose chief Scottish priory was situated at the adjacent village of Torpichen. A curious tower-like edifice near the railroad station is still pointed out as being a residence of the Knights. Pop. (burgh), 1901, 4279; 1911, 4002. Consult Waldie, *History of Linlithgow* (3d ed., Linlithgow, 1879).

LINN. Various species of the genus *Tilia*. See Lime Tree.

LINNÆAN SOCIETY. See Linnean Society of London.

LINNÆITE, lĭ-nē′ĭt. A sulphide of cobalt which also contains some nickel. It occurs in isometric crystals with other nickel and cobalt minerals.

LINNÆ′US, Carolus (1707–78). The generally used Latin name of Carl von Linné, the great Swedish naturalist, who is chiefly thought of as the originator of the modern nomenclatorial methods as applied to plants and animals, but is to be regarded in a broader sense as the forerunner of the modern systematists.

He was born in Råshult in Småland, Sweden, May 13 (old style; May 23, new style), 1707. His father, Nils Linnæus, was at that time a Lutheran vicar, who in 1709 became pastor. His mother was Christina Brodersson, daughter of the previous incumbent in the pastorate. The antecedents of Linnæus thus account for the desire which prompted and directed the efforts of his parents, in spite of their narrow circumstances, to give him the proper education for the ministry. Nevertheless it would seem that Nils Linnæus unconsciously gave a trend to the young mind of his first-born which may account for the direction which it afterward took in the man; for the pastor was an intelligent gardener, partly for the love of it and partly from necessity, and Linnæus wrote of his father: "He was an uncommon lover of rarities, and had a select garden of uncommon plants."

When the future naturalist was four years of age, it appears that, in spite of his tender years, he was unusually inquisitive in regard to plants. When he reached the age of eight he was assigned a garden spot of his own, and showed much energy in implanting all manner of wild growths. Certainly within these early childish years Linnæus had begun his course as a naturalist; for his love of collecting and habits of observation did in his case what they have in many another—they absorbed his real interest, while his regular tasks were performed more or less perfunctorily. It was fortunate for the boy's peace of mind that his first schoolmaster, Lannerus, in the school at Vexiö, to which he was sent in 1717, was himself fond of botany and encouraged the boy in his botanizing. After seven years of the Gymnasium he passed into the college in the same town, but his academic behavior so ill satisfied his father that he became disturbed for the young man's future. Though Linnæus expressed his willingness to conform to his father's wishes and enter the ministry, he pleaded that he should be allowed to follow his own inclination. The father, however, urged by others who regarded Linnæus unfavorably, determined to apprentice him to a tradesman. From this fate, however, he was rescued through the intercession of Rothmann, a physician of the town of Vexiö, who, recognizing Linnæus' industry and ability, directed his studies in physiology and supplied him with books on botany and medicine. Rothmann, in whose house he was at that time living with his father's consent, had the rare experience of bringing a young man to his life work; and this circumstance illustrates most strikingly the wisdom of directing the young mind into its natural channels. After being with Rothmann, Linnæus went (1727) to Lund, where he furthered his studies under Dr. Kelian Stobæus for a year, after which he went, on Rothmann's advice, to Upsala, where the renowned Rudbeck was teaching. Stobæus seems to have been offended at this, since he was not consulted in regard to the change. The young man arrived at Upsala with little money, and no prospect of self-support, which was the first consideration. While in this state of uncertainty he was one day examining plants in the garden of the university, when Dr. Celsius, a physician and botanist, met him, and shortly afterward engaged him as an assistant in compiling a treatise on the plants of the Bible (*Hierobotanicon*), giving him a home in return, and by recommendations enabling him to get opportunities to give private instruction. While with Celsius he became interested in Vaillant's *Sermo de Structura Florum* (Leyden, 1718) and in Wallin's *Gamos Phyton* (Upsala, 1729), the study of which led him to the writing of an essay on the sexes in plants. This essay served to recommend him to Rudbeck, to whom he was favorably introduced by Celsius. This introduction led to his appointment as Rudbeck's adjunctus, at the same time being appointed to direct the garden in which he would gladly have become a gardener the year previous.

On May 12, 1732, he set out on an exploration of Lapland, carrying his whole outfit on his back. The cost of the journey ($125), which covered upward of 5000 miles, was defrayed by the Academy of Sciences of Upsala. His botanical results were published in his *Flora Lapponica*, which appeared five years later. An account of this journey is contained in the *Lachesis Lapponica*, which was translated in

1811 by J. E. Smith, the first president of the Linnean Society of London, by whom also the Linnæan collections and library were purchased in 1783. On his return from Lapland he made a scientific journey through Dalecarlia at the invitation of the Governor. While at Falun, where he attracted large numbers of people to some public lectures, he met the woman who afterward became his wife, viz., Sara, the daughter of Dr. Moré (Moræus), under whose patronage he went to the Netherlands to study for his degree in medicine. This he received in 1735 at Harderwijk. It was in this year that Linnæus published his *Systema Naturæ*, it being sent to the press at the expense of Dr. Gronovius, who at once recognized its value. This paper, the first edition of which consisted of eight folio sheets, ran through 12 editions, at the same time being expanded.

After obtaining his degree he came under the patronage of George Clifford, a banker of Amsterdam, who had a large garden at his estate, De Hertenkamp. His studies of Clifford's plants appeared as the *Hortus Cliffortianus*. Linnæus stayed in Holland till 1739, and during his residence here wrote, besides the works mentioned above, his *Fundamenta Botanica*, *Bibliotheca Botanica* (both 1736), *Critica Botanica*, *Genera Plantarum* (both 1737), and his *Classes Plantarum* (1738). During this time also his scientific and influential acquaintance and his reputation increased very widely, so that, on prosecuting a journey to France and England, he received considerable, though in different places unequal, attention and recognition.

Returning to the Netherlands, he spent some time in the garden of Van Royen in Leyden. After his recovery from an illness through which he was tended by Clifford, he settled down to the practice of medicine at Stockholm, where, being comparatively unknown, he had little practice. He gained at length the appointment of naval physician (1739), and was at this time enabled to marry. He was honored in Stockholm by the presidency of the academy. In 1741 he was appointed professor of medicine in the University of Upsala, at which time also Rosén was appointed to the chair of botany. During this year Linnæus made a scientific tour of Oland and Gothland, the scientific results of which were published as "Oländska och Gothländska Resa" in 1745. In this paper popular names were first used. In the year following, 1742, Linnæus and Rosén exchanged their offices to their mutual advantage and satisfaction, and this circumstance marks the beginning of his career as teacher and student, which was free from care and uncertainty, and in which he reaped the reward of his previous diligence and perseverance. Until 1778, a period of 37 years was spent in teaching, study, and writing. Students crowded to the university to hear him; the many whom he won to the science of natural history went all over the earth in search of materials, and specimens poured into his hands from all quarters. His reputation became unique and world-wide. During this time, in addition to the revised editions of his previously published works, he wrote the famous *Philosophia Botanica* (1751), *Flora Suecica* (1745), *Fauna Suecica* (1746), *Hortus Upsaliensis* (1748), and the *Species Plantarum* (1753), in addition to other papers on Materia Medica. His *Philosophia Botanica*, and especially his *Species Plantarum*, have been truly regarded as epoch-making, as may be judged from the fact that in 1892 the systematic botanists in convention at Rochester formally adopted the date of publication of the *Species Plantarum* as the starting point for modern nomenclatorial rulings. The Linnæan system is still widely used in the schools of Germany, although superseded by more natural systems for general uses.

In 1761 he received the title of nobility, dated back to 1757, and was thereafter known as Carl von Linné. In 1767, at the age of 60, his remarkable memory began to fail. From 1774 to the time of his death, on Jan. 10, 1778, he suffered greatly as the result of apoplexy, having had no use of his right side for two years before he finally succumbed. He was buried in the cathedral at Upsala.

It is impossible within the limits of a brief biographical sketch to do justice to this great man, for he more than any other has influenced modern systematology. He was the first to use a binomial nomenclature, although his use of it did not correspond to the present method. With Linnæus the specific name stood in the margin and had indexical value, while the generic name stood at the head of the description. His descriptions were stripped of all unnecessary words, and under his skill became terse diagnostic statements of pertinent characters. The system, which consisted in the classification of plants according to the number of stamens and pistils, was avowedly artificial, but was used by Linnæus to get order out of chaos.

Bibliography. For the Linnæus jubilee (1907) many contributions to the literature on the botanist were published: T. M. Fries, *Linné, Lefnadsteckning* (2 vols., Stockholm, 1903), the main work on Linné's life; O. Levertin, *Carl v. Linné* (ib., 1906); J. M. Hulth, *Bibliographia Linnæana* (Upsala, 1907); O. Hjelt et al., *Carl v. Linné's betydelse såsom naturforskare och läkare* (ib., 1907; Ger. trans., 1908).

LINNÉ, lĕn'nå, Carl von. See Linnæus, Carolus.

LINNÉ, P. J. See Lenné, P. J.

LINNE'AN SOCIETY OF LONDON. A British scientific society, founded in February, 1788, by Sir James Edward Smith, a leading botanist, who bought from the executors of Linnæus his library, manuscripts, and natural-history collections. It was incorporated by royal charter in March, 1802. The society annually awards a gold medal, alternating between a botanist and a zoölogist. The papers read at the fortnightly meetings are published in expensive illustrated quarto "Transactions" and octavo "Journals." The headquarters of the society are at Burlington House.

LIN'NELL, John (1792–1882). An English landscape and portrait painter and engraver. He was born in London. At the age of 12 he became a pupil of Benjamin West, and later entered John Varley's studio, where he learned more from Mulready, a fellow pupil, than from his master. In 1805 he entered the schools of the Royal Academy. During the early part of his career he painted good portraits, numbering among his sitters Thomas Carlyle and other celebrated contemporaries. But it was in landscape work that he won renown. He at first preferred glowing sunset and cloud effects, but his later work shows the influence of the Pre-Raphaelites in minute detail. His pictures are, for the most part, in public and private collections of England. In the Tate Gallery, London, are his "Wood-Cutters," the "Windmill," "Noonday Rest," and three others; in the South Kensington Museum, "Wild Flower Gatherers," "The Harvest Moon," and others; in the Metropolitan Museum, New York, "The Monarch Oak." He also painted biblical subjects (chiefly interesting however as landscape studies), such as "Christ's Appearance to His Disciples on the Road to Emmaus" and "Eve of the Deluge." He also executed many miniatures on ivory, and was an engraver of some note. His two sons, James Thomas and William L., also landscape painters, inherited much of their father's talent. Consult Story, *John Linnell* (London, 1892).

LIN′NET (AS. *līnete*, OF., Fr. *linot*, linnet, from Lat. *linum*, flax; so called from their feeding on flaxseed). A finch of the genus *Linaria*, or some near relative. The size is small, the tail forked, and the colors brown mixed with white, and more or less flushed with crimson, especially in the spring dress of the male. All belong to northerly regions. The linnet (*Acanthis*, or *Carduelis*, *cannabina*) is well known through Europe and northern Asia. In its winter plumage its prevailing color is brown, the quill and tail feathers black with white edges; in the nuptial plumage the crown of the head and the breast are bright vermilion color, and a general brightening of color takes place over the rest of the plumage. This change of plumage causes it to be designated by fanciers as brown, gray, or rose linnet, according to the season of the year and the sex. It is the *lintie* of the Scotch. The sweetness of its song makes it everywhere a favorite. It sings well in a cage, and readily breeds in confinement, but the brightness of the nuptial plumage never appears. The linnet abounds chiefly in somewhat open districts, and seems to prefer uncultivated and furze-covered grounds. Its nest is very often in a furze bush or hawthorn hedge, and is formed of small twigs and stems of grass, nicely lined with wool or hair; the eggs are four or five in number, pale bluish white, speckled with purple and brown. Linnets congregate in large flocks in winter, and in great part desert the uplands and resort to the seacoast. In the eastern United States the name is sometimes given to the redpolls (q.v.) and to the purple finch (*Carpodacus purpureus*), a handsome bird over 6 inches long. The male in full plumage has the head and anterior parts of the body rose purple, in the same manner as the true linnet. The female is plain brown, much streaked. See House Finch; Pine Finch; Cage Birds, with the illustrations and authorities cited thereunder.

LINO′LEUM (Neo-Lat., from Lat. *linum*, flax + *oleum*, oil). A peculiar preparation of linseed oil in which the latter is so treated that it becomes solid. The floor covering known as linoleum is made by mixing the linoleum cement made from oxidized linseed oil with various gum resins, ground cork, and pigments, or "fillers." According to the Walton process, the linoleum cement is prepared by pouring successive layers of boiled linseed oil over a thin cotton fabric called *scrim*, which is allowed to dry thoroughly between the applications of the oil. The operation of drying takes about 24 hours, and the oil is applied daily for six or eight weeks. By this time the oxidized oil is about one-half an inch thick and is called a skin. These skins are cut down and ground between rollers and then thoroughly mixed with resin and kauri gum. According to the Parnacott process, also used extensively, the oil is thickened by heating it, while a current of air is continuously blown through it. In this way in from 15 to 18 hours the oil can be oxidized, thickening to a spongy mass, relatively free from stickiness at the end. This is mixed with the resin, as before mentioned. The powdered cork is next added, and if the linoleum is to be plain, coloring matter is also added. This mixture is then applied to jute burlap and the fabric passed between rollers to even off the surface. The pattern is printed in the same manner as upon oilcloth (q.v.), or for inlaid linoleum, tessera of different colored composition are pieced together and rolled with heated rolls. The latter is far better, as the pattern is retained as long as the fabric endures. Consult *History and Manufacture of Floor Cloths* (New York, 1898); *Drying Oils, Boiled Oils, and Solid and Liquid Driers, etc.*, by Lord Edgar Andés (London, 1901); J. I. Lewkowitsch, *Chemical Technology and Analysis of Oils, Fats, and Waxes* (4th ed., ib., 1909); J. G. MacIntosh, *Manufacture of Varnish and Kindred Industries*, vol. i (2d ed., ib., 1904–11). See Lincrusta Walton.

LINOTYPE, lĭn′ō-tīp. See Typesetting Machines.

LIN′SANG (East Indian name). 1. A small, catlike viverrine or civet (q.v.) of the genus *Prionodon* or *Linsang*, inhabiting the Oriental region. The claws are quite retractile, and the feet furry, like a cat's; and there is no second upper molar. Three species exist in the Malay Peninsula and islands, of which *Prionodon particolor* is best known. It is grayish, profusely marked with large black spots and stripes. It is equally at home in trees or on the ground; feeds principally upon birds; and bears two young, once in six months, in a den in a hollow tree.

2. A very similar animal (*Poiana poënsis*) of Fernando Po, West Africa. This animal, however, resembles a genet in behavior.

LIN′SEED (AS. *līnsæd*, flaxseed, from *līn*, flax + *sæd*, seed). The seed of the *Linum usitatissimum*, or flax plant. In America flax is grown almost wholly for the seed. It is chiefly raised in the Northwest, where it is sown broadcast in the spring on new land, or drilled in on old land for wheat or oats. It is harvested and threshed by machinery. (See Flax.) The seed is raised for the oil. Linseed oil is obtained in two ways—by hot pressure and by extraction with naphtha or other solvents, the latter process being the more complete and commonly employed at present. An important by-product of both processes is the residue known as oil cake, which in America is ground and sold as linseed meal. It is a very rich and valuable feeding stuff for animals and is exported extensively. The ordinary linseed oil of commerce is an amber-colored liquid, of a disagreeable taste and odor, largely used in the manufacture of paints, varnishes, and in oilcloth, linoleum, and similar fabrics. When boiled, either alone or with white lead or litharge, it dries much more rapidly on exposure to the air than the unboiled oil. See Oils; Linseed Meal; Oil Cake.

LINSEED MEAL. Often called oil meal in the United States. The residue from the separation of linseed oil from flaxseed. It is of two classes, distinguished as old-process and new-process linseed meal. In the old process the oil is expressed, and the residue is in the form of hard cakes, which are either sold as oil cakes or linseed cake, or ground to a meal. In the new process the linseed oil is more thoroughly removed with the aid of solvents, hence the meal contains less fat, but correspondingly more protein. Both kinds are on the market, but in the United States the product is nearly all the old-process meal. The difference in composition is shown by the following averages: Old-process linseed meal—water, 9.2 per cent; protein, 33.9; fat, 7.9; nitrogen-free extract, 34.4; fibre, 8.9; and ash, 5.7 per cent. New-process linseed meal —water, 10; protein, 37.0; fat, 2.0; nitrogen-free extract, 36.6; fibre, 8.8; and ash, 5.6 per cent.

Linseed meal is a highly prized feeding stuff for calves, fattening cattle, milch cows, horses, and other animals; but on account of its richness it should be fed only in small quantities. A large proportion of the meal produced in this country is exported to Europe.

LINSEED OIL. See Linseed; Oils.

LINT. See Charpie.

LIN′TEL (OF. *lintel*, Fr. *linteau*, from ML. *lintellus*, lintel, dim. of Lat. *limes*, limit). The horizontal beam spanning a doorway, window, or other opening, usually of stone or wood, but sometimes of iron. It is a short architrave, and it may also be cut in the mass in arch shape.

LIN′TERS. See Cottonseed.

LINTH, lĭnt, Escher von der. A Swiss statesman. See Escher von der Linth, Hans Konrad.

LIN′TON, lĭn′ton. A city in Greene Co., Ind., about 40 miles south-southeast of Terre Haute, on the Illinois Central, the Chicago, Terre Haute, and Southeastern, and the Chicago, Indiana, and Louisville railroads (Map: Indiana, C 6). It is in a productive coal-mining region and contains a Carnegie library. Oil and natural gas are found in the vicinity. Linton owns its electric-light plant. Pop., 1900, 3071; 1910, 5906.

LINTON, Eliza Lynn (1822–98). A novelist, wife of William James Linton (q.v.). She was born at Keswick, Cumberland, England, Feb. 10, 1822. A series of papers contributed to the *Saturday Review*, under the title "The Girl of the Period," attracted wide attention. They were collected and published independently in 1883. Mrs. Linton wrote many novels. *The True History of Joshua Davidson* (1872) and *The Autobiography of Christopher Kirkland* (1885) are representative of her best work. She died in London, July 14, 1898. Consult *My Literary Life*, published posthumously (London, 1899), with prefatory note by Beatrice Harraden, and G. S. Layard, *Life of Mrs. Lynn Linton* (ib., 1901).

LINTON, Sir James Dromgole (1840–1916). An English painter. He was born in London and studied at St. Martin's Art School and under Leigh. His early works were in water color, and he did much to spread the interest in that branch of painting. He was president of the Royal Institute of Painters in Water Color from 1884 to 1899 and was elected again in 1909. A fine series of his water colors is in the South Kensington Museum, including "The Student," "The Reliquary," and "Wall Flowers." After 1878 he worked chiefly in oils, and his subjects were mainly genre or historical. They are simply composed, with technical precision, yet charmingly delicate and fresh. Among the best are: "The Marriage of the Duke of Albany" (1885); "Maunday Thursday," and "Boccaccio: The Opening Scene of the Decamerone" (1900), a fine specimen of his decorative ability. He was knighted in 1885 and received various other distinctions. He wrote *Constable's Sketches in Oil and Water-Color* (1904).

LINTON, William James (1812–97). An Anglo-American wood engraver, author, and political reformer, born in London, Dec. 7, 1812. He learned engraving from G. W. Bonner, to whom he was apprenticed in 1828. In 1842 he became the partner of John Orrin Smith, a distinguished wood engraver, with whom he was employed on the *Illustrated London News*. As a young man, he was a zealous Chartist and continued through life a stanch defender of republicanism and the rights of workmen. To promulgate his ideas he founded, with Thornton Hunt and George Henry Lewes, the *Leader*, a daily (1850) which he abandoned because it was not sufficiently radical. He was a friend of Mazzini, the Italian patriot, whose views he expounded in the *Red Republican*. In 1852 he started the *English Republic*, a monthly magazine aiming to explain republican principles. He also contributed articles on social questions to the *Nation* (an Irish patriotic paper), the *Westminster Review*, the *Examiner*, and the *Spectator*. In the middle of the century Linton's reputation as the best English wood engraver of his day was established, and posterity has confirmed the verdict. He did much work as a book illustrator, in which capacity his engravings for the Moxon illustrated Tennyson are representative. In 1858 Linton married Eliza Lynn (see Linton, Eliza Lynn), and it is her book on the Lake country that he illustrated. The marriage proved uncongenial, and the couple amicably parted. A brief visit to the United States (1866) resulted in his finally settling there for the rest of his life, which was thenceforth mainly devoted to the regeneration of wood engraving in America. With his children he settled near New Haven, Conn., set up a printing press, began a most important activity as an engraver, and formed a circle of disciples. Following the traditions of Bewick (q.v.), he championed the use of the white line and legitimate wood engraving (q.v.), as against the manipulative skill of the American school and the new methods of photographic reproductions. Out of Linton's study and practice of his art came *Practical Hints on Wood Engraving* (1879), *A History of Wood-Engraving in America* (1882), *Wood Engraving: A Manual of Instruction* (1884), and *The Masters of Wood-Engraving* (1890)—works as admirable from the practical as from the literary and scholarly point of view. Among his books highly prized by bibliophiles is *The Golden Apples of Hesperus*, a group of little-known sixteenth and seventeenth century lyrics. His other works include: *James Watson: A Memoir of Chartist Times* (1879); *Poems and Translations* (1889); lives of Thomas Paine (1891) and Whittier, in the "Great Writers Series" (1893). Consult his autobiography, *Memories* (London, 1895), and G. S. Layard, *Life of Mrs. Lynn Linton* (ib., 1901).

LIN TSEH-SŬ, lĭn′ tsă′-sōō′ (1785–1850). An able Chinese high official who attained international reputation as "Commissioner Lin." He was born in the Province of Fukien and until he was 17 years old assisted his father as a maker of artificial flowers. Aided by a wealthy friend, whose daughter he married, he became a student, successfully passed the different examinations leading to the doctorate, in 1811 received the degree of *Chin-shih*, the highest in China, and was made censor. He rose rapidly through various grades of provincial service, and became Governor-General of Hunan and Hupeh in 1837. Here he suppressed the opium traffic with such vigor that in 1838 he was sent to Canton to deal with the opium situation there. It was his uncompromising attitude against the introduction of opium, which had been declared contraband of war, together with his destruction of $11,000,000 worth of the drug at Canton belonging to foreign merchants, which led to the "Opium War" with Great Britain. In 1839 he became Governor-General of the two Kwang provinces; but as his relations with the British government representatives became more and more unsatisfactory, the Emperor recalled him to Peking in 1841. In 1843 he was banished to Ili (Kulja), where he was engaged in reclaiming marshes and waste lands in various parts of Sungaria and East Turkestan. At the end of 1845 he was recalled, became acting Governor-General of Shenken, Governor of Shansi in 1846, Governor-General of Yunkwei in 1847, and on the outbreak of the Taiping rebellion in Kwangsi was made acting Governor of that province. Three years afterward, while on his way to attack the rebels, he died. A patriot of ability, but lacking in statesmanship, he was opposed to the opening of the country. Feeling the need of a better knowledge of foreigners, he collected much material for a geography of the world. This was given to another hand, also antiforeign, and in 1844 his great *Geography* was published in 50 books.

LI'NUM (Lat., flax). A genus of plants belonging to the family Linaceæ and containing about eight species, distributed through temperate and warm regions. By far the most important species is *Linum usitatissimum*, whose stems yield flax fibre (linen), and whose seeds yield linseed oil. It is a European species, but cultivated in this country, and is occasionally spontaneous in fields and on roadsides. The characteristic American species is *Linum lewisii* (prairie flax), occurring on the prairies of Dakota and ranging southward to Texas and Arizona and northwestward even to Alaska. This Western flax was for a long time confused with *Linum perenne*, a European form which it closely resembles. A common garden annual, *Linum grandiflorum* (flowering flax), somewhat resembles a single-flowered pink and is one of the few species of flax with red flowers.

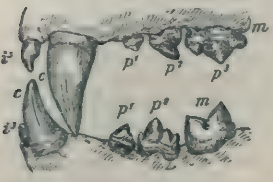
LI'NUS (Lat., from Gk. *Λινος*). A personification of lamentation, called the son of Apollo and a muse (e.g., Calliope, q.v.) or of Amphimarus and Urania. He was the subject of various legends, especially at Argos and Thebes: in one story, the Theban, he was a wonderful musician, the inventor of the Linus song, a song to which special music was appropriated, sung first in Asia Minor, later in Greece. He is said to have been slain by Apollo for contesting with the god in music. Linus was worshiped near Mount Helicon with annual sacrifices and dirges (*lini*). A later story declares that this Linus or a later Linus was teacher of music to Hercules and that, when he rebuked Hercules for dullness, the latter killed him. Linus has been explained as a representative of the tender vegetation destroyed by the summer heat. Thus, Frazer identifies Linus with Adonis and makes the Linus song the lament of the reapers over the dead grain spirit. Consult: H. K. Brugsch, *Die Adonis Sage und das Linoslied* (1859); J. G. Frazer, *The Golden Bough*, vol. ii (2d ed., London, 1911); Mannheim, *Wald- und Feldculte*, vol. ii.

LI'NUS, SAINT. Second Bishop of Rome (67–?79). Irenæus (*Adv. Haer.*, iii, 3), in the latter half of the second century, says that "Peter and Paul, when they founded and built up the Church of Rome, committed the office of its episcopate to Linus," to whom Paul sent greetings (2 Tim. iv. 21). Eusebius, in the first half of the fourth century, followed by Theodoret in the fifth, states that Linus became Bishop of Rome after the death of Peter. Tertullian, Jerome, and others, however, make Clement follow Peter as Bishop of Rome.

LINZ, lĭnts. The capital of the Crownland of Upper Austria. It is situated in a pleasant district on the right bank of the Danube, which is crossed by an iron bridge, connecting Linz with Urfahr, 117 miles by rail west of Vienna (Map: Austria-Hungary, D 2). It is a strongly fortified town with two suburbs, Lustenau and Waldegg. It has several fine squares and monuments, a seventeenth-century cathedral, a cathedral begun in 1862, a municipal parish church (1286), a castle now used as an armory, the episcopal residence, the state theatre, and a museum, with a library. Linz manufactures locomotives and other machinery, lamps, heavy bells, matches, dyes, lacquer ware, woolen goods, lumber, wagons, leather, beer, and tobacco. It has also a shipyard, a state tobacco factory employing 1000 hands, and a chamber of commerce. The city is well supplied with educational institutions and hospitals and has a deaf and dumb institute and a library (50,000 volumes). Steamboats daily ply up the river to Ratisbon and down to Vienna. Pop., 1900, 58,778; 1910, 67,817, mostly German Catholics. Linz was the Roman camp Lentia.

LINZ, AMÉLIE (1824–1904). A German author, born at Bamberg. She married an officer of engineers and four years after his death (1870) settled at Munich. Her literary work, largely under the influence of Paul Heyse, published under the name Amélie Godin, includes the novels *Eine Katastrophe* (1862), *Frauenliebe und Leben* (1874), *Gräfin Leonore* (1882), *Freudvoll und Leidvoll* (1883), *Fahre wohl* (1886), *Mutter und Sohn* (1897), and *Dora Reval* (1901); and several collections of fairy tales, such as *Märchen von einer Mutter erdacht* (4th ed., 1860), *Slavische Märchen* (1879), *Polnische Volksmärchen* (1880), *Grosses Märchenbuch* (4th ed., 1886), *Märchenkranz* (2d ed., 1896), and others.

LION (AS. *lēo*, OF. *lion*, *leon*, Fr. *lion*, It. *leone*, *lione*, from Lat. *leo*, from Gk. *λέων*, *leōn*, lion). The most famous of the great cats (*Felis leo*) and distinguished from all others by its mane and the hairy tuft at the end of the tail. It inhabits Africa and southwestern Asia. A lion of large size stands 3 feet high and measures about 9½ feet from the nose to the tip of the tail, which is about 3 feet long; but most specimens fall short of these figures. The greatest size seems to be attained in South Africa. The weight rarely reaches 500 pounds. The skull of an adult may measure 13 inches in length, and 9½ inches in breadth across the cheek bones. In accordance with its desert life its color is a uniform pale tawny, sometimes reddish and occasionally almost black. Though never streaked or spotted, the mane is frequently darker than the coat or even diversified with blackish patches. Kittens are obscurely spotted and striped at first, as is the case with other concolorous species of groups generally spotted, but this disappears after a few months. The lioness is somewhat smaller than the lion and has no mane—nor have young males. Sometimes they never acquire more than a scanty ornament of this kind, but the so-called "maneless lion of Gujarat" seems not to exist as a separate race. There is, however, great diversity in this feature, as in color, even within the same litter. The mane is evidently a sexual ornament, and also a shield, which offers some protection to the males in the combats which occur in this species more frequently and with more fierceness than in the case of any other wild cat of which we know. The whole frame is extremely muscular, and the fore parts in particular are remarkably powerful, giving, with the large head and copious mane, a noble appearance to the animal, which, with its strength and its appalling voice, has led to its being called the "king of beasts." The accompanying nobility of character which has been ascribed to it by Buffon and his followers seems, however, largely fanciful.



TEETH OF THE LION.

Permanent dentition: *i*, incisors; *c*, canines; *p*, premolars; *m*, molars. In the upper jaw p^3 is the upper carnassial, and in the lower jaw *m* indicates the lower carnassial tooth.

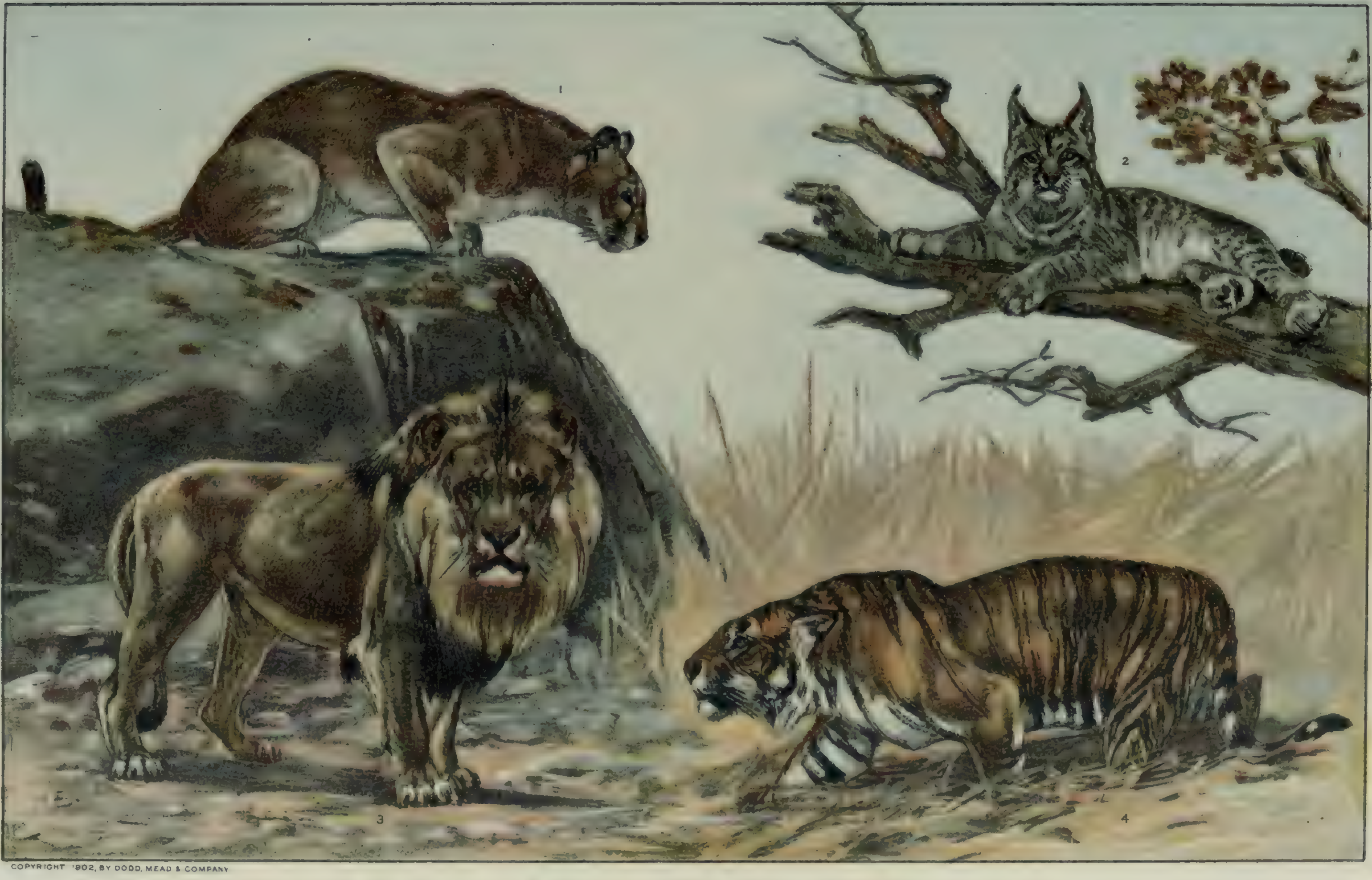
Habitat. In the time preceding the Glacial epoch lions, indistinguishable by their remains, entombed in the floors of caves, from modern forms, roamed over all southern Europe, Germany, France, and the British Isles. They seem to have been exterminated in the north and west by the glacial cold, but survived in southeastern Europe well into historic times, for the Romans knew of them anciently in what is now Rumania, Greece, and European Turkey; and still more recently they have existed in Syria and Arabia. These animals probably were driven away by man. They were also formerly numerous from the Caucasus to Afghanistan and Baluchistan, but are now scarce and local in Asia, extinct in Asia Minor, Arabia, and Egypt, and have nearly or quite disappeared from Algeria.

In Asia they were formerly abundant on the sandy wastes of Rajputana and the high plains of Persia, but now have almost or quite disappeared from India and are confined to the swampy lowlands of the Tigris and Euphrates valleys, and certain valleys east of the Persian Gulf; in Africa they are to be found in the naked deserts of the southern Sahara, the Kalihari Desert, and the Abyssinian regions, as well as among the rough hills of Mashonaland and the dense swamps of the upper Nile tributaries. Everywhere, during the day, they are likely to hide and sleep in secluded clusters of brush-grown rocks, thickets of thorny bushes, or patches of reeds or tall grass with the color of which their yellow coats are perfectly in accord. It is in such haunts and in the spring that the whelps are born. Usually there are three young, and rarely are more than five produced. They are born with their eyes open (the pupils are round). Although during the pairing season the lioness apparently delights in provoking jealous combats for her favors, by which the weaker members of the race are continually "weeded out" and only the strongest survive to produce offspring (see SEXUAL SELECTION), she makes a devoted mother, and the male stays with his family and assists in supplying their wants until the young are well grown. It is said that old lions of unusual strength are often polygamous; and it is also asserted that ordinarily the same mates keep together for several successive seasons or for life. Probably both assertions are true; likely it is also true that other pairs change annually. Where the animals are or were very numerous, polygamy and frequent change of mate would be likely to happen more often than where they were few and the range of choice correspondingly limited. No young lion can get a mate, nor an old one keep her, where others are about, except by fighting.

Where lions have not been much disturbed by guns they are likely to be seen abroad and hunting in the daytime, sometimes in small family troops, but elsewhere, and generally, they prowl and hunt at night. Though able to gallop swiftly for a short distance, their weight and their feline nature incline them to adopt stealthy approach or ambush in their hunting. They are unable to climb trees, but are nimble enough in scrambling about rocks. Knowing the habits of the animals they seek, they wait beside their paths or at their drinking places, or skillfully stalk them in the open, depending as much probably on their eyesight as on their faculty of scent. What they eat depends upon where they live. In India deer, antelopes, wild boars, and lesser wild animals are largely supplemented by domestic or semidomestic cattle, goats, pigs, ponies, camels, and an occasional Hindu. In Mesopotamia the lions would greatly decrease or starve were it not for the large herds of half-wild pigs that range the oak forests east of the Persian Gulf. In Africa their great numbers were correlative with the hordes of game with which that continent was frequently overrun, and the disappearance of this game means the doom of the "king of beasts," unless cattle replace the wild grazers. The elephant, rhinoceros, and hippopotamus are beyond its powers, and the buffalo is able to resist a single lion, as a rule, though frequently pulled down by two or three acting in concert. The larger antelopes and equine animals are the lion's natural and constant prey, and it seems to prefer the latter—the zebras and wild asses. These animals, however, keep in the open plains, are quick to perceive and swift to escape intended attack, and in the days when game was abundant most lions fed mainly on antelopes. Even here, however, they had not always an easy victim. Schulz, who gives an unusual amount of information as to the Central African lion in his *New Africa*, says that this beast does not dare attack roan and Harris's antelopes in his usual manner, a leap from behind to the haunches, "for with their backward sweeping horns they are able to make things lively for any lion foolish enough to make the attempt. These, with hornless game, such as the quagga, they seize by the nose."

The method of attack has been described in so many ways by creditable hunters and native observers that it is evident no one method exists; but if the first lightning-like leap and

CAT FAMILY - FELIDÆ



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1	PUMA - FELIS CONCOLOR	1/14 NATURAL SIZE	3	LION - FELIS LEO	1/30 NATURAL SIZE
2	LYNX - LYNX BOREALIS	1/15 " "	4	TIGER - FELIS TIGRIS	1/26 " "

overbearing stroke does not crush the animal, the nose may be seized in a paw and the head jerked back, breaking the neck; or the great blood vessels of the throat may be gnawed open, or the animal simply be mauled to death. It is customary for the lion, like other great cats, to carry or drag its prey into a thicket or near its lair before feeding upon it, and under the excitement of being disturbed and chased it is capable of extraordinary feats of strength in so doing, but these seem to have been exaggerated. That he can drag a large animal a considerable distance is undoubted. Having killed his prey, he eats at once what he wants of it. If other lions have helped him, they get what they are able to take. When they are satisfied, any lioness or young lions near by get such shares of what remains as their agility and courage enable them to seize.

Wherever settlements are made in a district infested by lions, these animals profit by raids upon domestic animals; and the scarcer the wild prey becomes, and the more familiarity the lions acquire with man and his ways, the more harm they do. Few fences or stockades are effective against them. The next step is the habit of occasional or persistent preying upon humanity. How the lion of the wilderness behaves in the presence of man depends upon such a diversity of circumstances, and so varies with individuals, that it is not safe to generalize. If he is not hungry and has a free way for retreat, he will very likely run when a man is met; but he may charge on the instant. A few brought to bay have been known to cower, but the majority fight for life bravely. Occasionally certain lions, like tigers, get into the habit of deliberately seeking human flesh. They are often old, weakened ones, no longer capable of hunting well, but sometimes are individuals, wiser than the ordinary, who have learned that humanity is the easiest possible prey. Such animals must be got rid of, and in Africa parties are organized to hunt and kill them—an achievement rarely accomplished without further loss of human life.

The hunting of lions is done nowadays almost altogether on foot, by lying in wait at night at their drinking places or by seeking them by day in their lairs. The literature of sport in Africa, Persia, and India abounds in thrilling tales of adventures thus encountered. Various traps have always been used for their capture, the most successful of which is the pitfall, and by this means principally were captured the great numbers of lions familiar to the civilized people of antiquity. See Hunting Big Game.

This imposing animal, we are told, makes its appearance in art and literature very early. Frequent mention is made of it in the cuneiform tablets and Hebrew Scriptures. In the so-called *Song of Pentaur*, describing the war of Ramses II against the Cheta, lions are said to have accompanied the King's chariot. They were kept in all the Roman cities for the public sports, and hundreds were sometimes provided for the entertainment of the populace in a single series of games. They were pitted against each other, or some other great beasts, but mainly they were matched against the bestiarii, or professional animal killers of the arena. So great and lasting was the demand for this purpose that the supply became scanty, and the Emperor Honorius, in the fifth century, enacted laws prohibiting the killing of African lions. Under this protection they so increased and became so bold in their destruction of villagers and cattle that Justinian was compelled to rescind the edict. Extraordinary stories are told of the degree of tamability and education reached by some of these ancient lions, but they should be received with distrust. The kittens are playful, gentle, and affectionate, and some adults are docile, subdued, and even seem to care for their teachers, but none is really trustworthy; all must be kept in subjection by fear, and their acquired intelligence is very small. The tricks and performances which the trained beasts of the menagerie go through are usually very simple when analyzed. Lions withstand captivity well, however, and finer specimens have probably been reared in zoölogical gardens than ever were seen in the wilderness. They breed readily, even in traveling menageries, and few if any now exhibited were not born in captivity.

For the Asiatic lion, consult authorities mentioned under Tiger. See Colored Plate of Felidæ.

Bibliography. A good account will be found in the *Royal Natural History* (London, 1895; New York, as the *New Natural History*, about 1898). J. H. Porter, *Wild Beasts* (New York, 1894), has a very complete and judicious summary of the animal's biography; while the best recent accounts are Richard Lydekker, *Game Animals of Africa* (London, 1908), and Roosevelt and Heller, *Life-Histories of African Game Animals* (New York, 1914). For the African lion and its hunting, consult the writings of many missionary travelers and hunters, especially David Livingstone, *Missionary Travels and Researches in South Africa* (London, 1857); and Robert Moffat, *Missionary Labors and Scenes in South Africa* (ib., 1845); Gordon-Cumming, *A Hunter's Life in Africa* (New York, 1850); Daumas, *Les chevaux du Sahara* (Paris, 1851); Harris, *Wild Sports in Southern Africa* (5th ed., London, 1852); Gérard, *La chasse au lion et les autres chasses de l'Algérie* (Paris, 1854); Blanford, *Geological and Zoölogical Survey of Abyssinia* (London, 1870); C. J. Anderson, *The Lion and the Elephant* (ib., 1873); W. H. Drummond, *The Large Game and Natural History of South and South East Africa* (Edinburgh, 1875); V. L. Cameron, *Across Africa* (London, 1877); G. Schweinfurth, *Heart of Africa* (Leipzig, 1878); Holub, *Seven Years in South Africa*, translated by Frewer (London, 1881); W. M. Kerr, *The Far Interior* (ib., 1886); F. C. Selous, *A Hunter's Wanderings in Africa* (ib., 1890); Sir S. W. Baker, *Wild Beasts and their Ways* (ib., 1890); Schulz and Hammar, *New Africa* (ib., 1897); Stevenson-Hamilton, *Animal Life in Africa* (New York, 1912); Sir A. E. Pease, *Book of the Lion* (2d ed., London, 1914). One of the most remarkable books on the achievements of maneating lions will be found in J. H. Patterson, *The Man-Eaters of Tsavo* (London, 1908).

LION, lē′ôɴ′, Golfe du. An inlet of the Mediterranean. See Lyons, Gulf of.

LION, Henry the. See Henry the Lion.

LION, Order of the. 1. A civil and military order, founded in 1770 by Landgrave Frederick II of Hesse-Cassel, with one class and 41 knights. In 1818 it was extended to four classes, but has now only one class. It is restricted to members of the grand ducal house and princes. 2. A civil order with three classes, founded in 1815 by William I, King of the Netherlands. The decoration is a white enameled cross with four W's, bearing the motto *Virtus nobilitat* (virtue ennobles) and on the reverse the golden lion. See Plate of ORDERS.

LI'ONFISH'. A gray, yellow-blotched sculpin (*Scorpæna grandicornis*), common among seaweed from Florida to Brazil and on account of its ugly aspect much dreaded by the fishermen.

LION GATE. The entrance to the acropolis of Mycenæ. The gateway, about 10 feet in height and width, is at the end of a walled passage designed to increase the difficulty of an attack. The great gateposts, of single blocks, approach slightly at the top. On them rests a lintel composed of a block 15½ feet long and 8 feet thick. Above the lintel a triangular space is left to distribute the vertical pressure and is occupied by a slab 12¼ feet wide and 10¼ feet high, on which is carved the celebrated relief which gives the gate its name. The middle of the slab is occupied by a column, flanked by two lions, whose hind feet are on the ground, while the forefeet rest on the base of the column. The heads were turned to the front, but are no longer extant. The structure probably dates from about 1180 B.C.

LIONNE, lē'ôn', HUGUES DE, MARQUIS DE BERNI (1611–71). A French statesman, born at Grenoble. He was of a noble family of Dauphiné and was brought up by his uncle, Abel de Servien, under whom he received his first training in diplomacy. Mazarin, then Prime Minister, recognizing Lionne's ability, gave him several important offices. As Secretary of the French Embassy, he was present at the Congress of Münster (1641) and the following year was sent on a mission to the Pope. He was appointed secretary to the Queen Mother, Anne of Austria, in 1646. Afterward he was Ambassador to Spain, Frankfort, and Turin, and as Minister of State, a position he received in 1659, concluded the Peace of the Pyrenees (1659). On his deathbed Mazarin recommended Lionne to the King, and for the next 10 years he had charge of foreign affairs. Among his most important negotiations were the sale of Dunkirk, the Treaty of Breda (1667), and the Treaty of Aix-la-Chapelle (1668). His *Memoirs* and letters are of value as throwing light on the diplomatic relations between France and Europe in the early part of the reign of Louis XIV. Consult Valfrey, *Hugues de Lionne, ses ambassades en Italie, en Espagne et en Allemagne* (Paris, 1877–81), and Chevalier, *Lettres inédites de Hugues de Lionne, ministre des affaires étrangères sous Louis XIV, précédées d'une notice historique sur la famille de Lionne* (Valence, 1879).

LION OF LUCERNE. A memorial at Lucerne, Switzerland, to the 781 Swiss guards who fell on Aug. 10, 1792, in defense of Louis XVI during the attack on the Tuileries. The figure is carved in the face of a cliff and represents a dying lion of colossal size, transfixed by a spear, but defending the lilies of France. The memorial was modeled by Thorvaldsen and was dedicated in 1821. Beneath it are inscribed the names of the 21 officers of the guards.

LION OF ST. MARK. The official device of the ancient Republic of Venice. A winged lion was the emblem of Mark the Evangelist, patron saint of Venice. It was depicted on the Venetian standard and modeled in bronze on one of the columns in the Piazzetta. The bronze was carried to Paris by Napoleon in 1797, but was restored in 1815.

LION OF THE NORTH. A title given to Gustavus Adolphus of Sweden.

LION'S MOUTH (It. *Bocca di Leone*). An opening in the wall of the Sala della Bussola, the antechamber of the Inquisitors, in the Palace of the Doges at Venice. The opening was once adorned with a marble lion's head, the mouth of which served as a channel for secret information and anonymous accusations.

LION-TAILED MONKEY. A macaque (*Macacus silenus*) of western India. It is of medium size, almost black in color and with the end of the comparatively short tail tufted. A large ruff of white hair surrounds the face and neck. This species goes in troops in the forest, is often called wanderoo, and is sulky and intractable in captivity.

LIOTARD, lē-ō'tär', JEAN ETIENNE (1702–89). A Swiss portrait painter, born at Geneva. He studied under Jean Baptiste Massé and Le Moyne in Paris, whither he went in 1723, devoting special attention to pastel. While in Constantinople, where he remained for several years, he portrayed many dignitaries and foreign ambassadors. In 1743 he went to Vienna and thence to Paris and London, everywhere painting the portraits of the great. After his sojourn in Constantinople he adopted the Turkish costume and hence was nicknamed "the Turk." In or about 1756 he visited Holland, was married there, and in 1773–74 was again in England, where he sold advantageously a valuable collection of paintings by celebrated masters. His forte lay in intensely individual and subtle pastel portraits, executed with rare psychological penetration, malicious fantasy, and delicate skill. Among the most celebrated are "Vienna Chocolate Girl" (Dresden Gallery) and Madame d'Epinay (Rath Museum, Geneva). The Amsterdam Museum contains "La belle Lyonnaise" (1746, replicas in Dresden and Vienna), and more than a dozen other portraits, including those of Maria Theresa, Joseph II, Marshal Maurice of Saxony, and Lord Bessborough. He also painted numerous portraits of himself, examples of which are in Dresden and in the Uffizi Gallery in Florence. Consult Humbert, Revilliod, and Tilanus, *La vie et les œuvres de J. E. Liotard* (Amsterdam, 1897), and Baud-Bovy, *Peintres genevois* (Geneva, 1903).

LIOUVILLE, lyōō'vēl', JOSEPH (1809–82). A French mathematician, born at Saint-Omer. He was educated as an engineer at the Ecole Polytechnique, where he became a professor of mathematics in 1833. In 1839 he took up the same duties at the Collège de France and in the same year was admitted to the Academy of Sciences. In 1848 he became a deputy in the Assembly for Meurthe. In 1836 he founded the *Journal de Mathématiques Pures et Appliquées*, better known as the *Journal de Liouville*. He edited Evariste Galois's *Œuvres mathématiques* (1840), Monge's *Géometrie*, and Navier's *Leçons;* and he published also many original *Notes* and *Mémoires*.

LIOY, lē-ō'ē, PAOLO (1836–1911). An Italian naturalist, best known for his studies of the lake dwellers. He was born in Vicenza, studied at Padua, and in 1866 was banished for expressing anti-Austrian sentiments in a newspaper article. He was elected to the Italian Parliament after the Austrian evacuation, took some part in politics, voting with the Moderate Liberal party, and wrote some fictions, biographies of Agassiz and of Darwin, and the following important scientific works: *Di una stazione lacustra scoperta nel lago di Fimon* (1864; 3d ed., 1876); *La abitazioni lacustri della età della pietra* (1865); *Conferenze scientifiche* (1872; 2d ed., 1877); *Sui alghi* (1884); *Escursione nel cielo* (4th ed., 1885); *Linneo, Darwin, Agassiz nello vita intima* (1904); *Apparitions et souvenirs* (1908); as well as other works on alpine climbing.

LIPÁ, lē-pä′. A town of Luzon, Philippines, in the Province of Batangas (Map: Philippine Islands, C 4). It is situated in a mountainous district, 18 miles north of Batangas, on the railroad between that city and Manila. It is also the junction point of three highways. It is a progressive town, the largest in the province, has a large church and good schools and markets, and is an important centre for the sugar, coffee, and tobacco trade. There are manufactures of rough textiles. During February fairs attract many people. Pop., 1903, 37,934.

LIPAN, lē̇-pän′. A little-known Apache tribe, formerly roaming along the lower Rio Grande in New Mexico and Texas. During the Texas Indian wars of 1845 and 1856 they were greatly reduced in strength and driven into Mexico, from whence a few survivors returned to the Mescalero Reservation in 1905. Consult P. E. Goddard, "Indians of the Southwest," in *American Museum of Natural History, Handbook Series, No. 2* (New York, 1912).

LIPARÆ′Æ IN′SULÆ. See LIPARI ISLANDS.

LIPARI, lĭp′ȧ-rĭ *or* lē′pȧ-rē̇ (or ÆOLIAN), **ISLANDS.** A group of seven large and many small islands in the Mediterranean, immediately north of Sicily, between long. 14° 15′ and 15° 15′ E. (Map: Italy, E 5). The larger isles are Lipari, Salina, Vulcano, Filicuri, Stromboli, Panaria, and Alicuri. The total area is about 45 square miles. They are all of volcanic origin, with peaks ranging in height from 1000 to 3140 feet. The islands of Stromboli, Lipari, and Vulcano still contain active volcanoes, Stromboli having been the scene of eruptions in 1902 and 1907, the latter destroying much property. The climate is mild and healthful. In spite of their volcanic nature, mountainous surface, and scarcity of water, the islands are, as a rule, well cultivated, producing wine, currants, olives, figs, other southern fruits, and salt. The largest island, Lipari, yields large quantities of pumice stone and contains hot springs. The group forms a part of the Sicilian Province of Messina. Pop., about 20,000. The town of Lipari, on the east coast of the island of the same name, has a good harbor. Pop., 1911 (commune), 15,616. Consult *Die liparische Inseln* (Prague, 1893).

LIP′ARITE. See RHYOLITE.

LIP′ASE (from Gk. λίπας, *lipas*, λίπος, *lipos*, fat). An enzyme which saponifies fats, i.e., decomposes them into fatty acids and glycerin. Among plants lipase is found in oily seeds when they germinate, and according to the latest work it is present also in such seeds when they are ripening. The synthesis of fats from fatty acid and glycerin is due to the reversible action of lipase. It is especially abundant in such seeds as castor oil, hemp, rape, and flax. It is doubtless also present in other parts of the plant where oil constitutes a reserve food. In germinating seeds the oil gradually disappears, the lipase digesting it and so rendering it available for the nutrition of the young embryo. The precise products of its action are not known. See DIGESTION IN PLANTS; ENZYME.

LIPETSK, lyĕ′pĕtsk. The capital of the District of Lipetsk in the Government of Tambov, Russia, situated on the Voronezh, 107 miles west of the town of Tambov (Map: Russia, E 4). It has manufactures of spirits, sugar, iron, brick, and tallow. There are exports of grain. It has noted chalybeate springs, discovered in 1700 by Peter I and much visited during the season, which lasts from the end of May to August. Pop., 1897, 20,323; 1913, 23,500.

LIPINSKY, lē̇-pĭn′skē̇, KARL JOSEPH (1790–1861). A famous Polish violinist, born at Radzyn. Excepting a little instruction from his father, a talented amateur, he was entirely self-taught. In 1810 he became concert master at the Lemberg Opera, advancing two years later to the post of conductor. He went to Italy in 1817 for the purpose of hearing Paganini. A close friendship soon sprang up between the two artists, which, however, came to a sudden end in 1829, when both appeared in Warsaw. Paganini's vanity could not bear the success of a rival. For the next decade Lipinsky's tours throughout Europe were a succession of triumphs. From 1839 until his retirement shortly before his death he occupied the position of concert master of the Royal Chapel at Dresden, which he completely reorganized and made one of the foremost institutions of Germany. He was famous for his powerful tone and marvelous dexterity in double stopping.

LI PO, lē pō. See LI TAI-PEH.

LIP′OGRAM (from Gk. λείπειν, *leipein*, to leave + γράμμα, *gramma*, letter). A species of verse characterized by the exclusion of a certain letter, either vowel or consonant. The earliest author of lipogrammatic verse was the Greek poet Lasos (born 538 B.C.), who composed an *Ode on the Centaurs* and a *Hymn to Ceres* in which the sigma was lacking. In the third century A.D. Nestor, of Laranda, composed an *Iliad* in 24 books, from each of which, in succession, one of the letters of the Greek alphabet was omitted. Two centuries later, Tryphiodorus, a Græco-Egyptian writer, composed an *Odyssey* on the same plan. Fabius Claudius Gordianus Fulgentius, a Christian monk of the sixth century, performed a similar feat in Latin. In modern times Spaniards and Italians have been most addicted to this laborious frivolity. Lope de Vega wrote five novels, from each of which one of the vowels is excluded; and Orazio Fidele wrote a poem entitled *R Banished by the Power of Love* (1633). In Germany the collection of Burmann, entitled *Poems without the Letter R* (1788), is composed in the same plan. Several French poets have also attempted this *tour de force*. The subject is discussed by Addison in an essay on true and false wit in No. 59 of the *Spectator*. Consult Wheatley's book on *Anagrams* (1862).

LIPO′MA. See TUMOR.

LIPOWITZ' METAL. See FUSIBLE METAL.

LIPPE, lĭp′pe. A principality and constituent state of the German Empire, between the Weser and the Teutoburger Wald, bounded on the northwest, west, and south by the Prussian (Westphalian) Government District of Minden, on the northeast by the Prussian Circle of Rinteln, belonging to Hesse-Nassau, and on the east by the Prussian Province of Hanover and an enclave (Pyrmont) of the Principality of Waldeck (Map: Germany, C 2). The area of Lippe—including its three small exclaves in Westphalia, viz., Kappel, Lipperode, and Grevenhagen—is 1215 square kilometers (469 square miles).

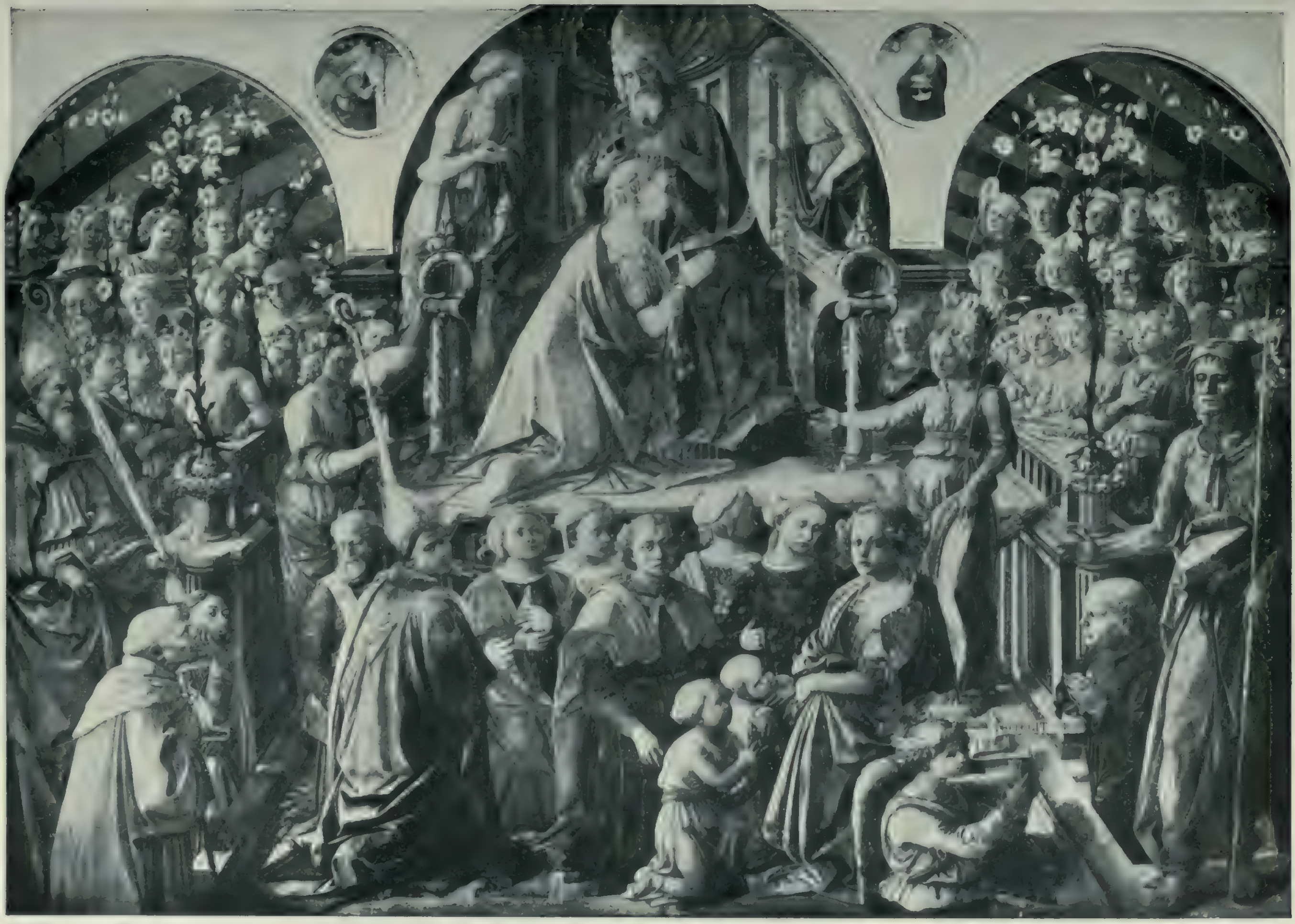
For the most part the surface is hilly, but there are no lofty mountains. The highest elevations are in the southwest, in the Teutoburger Wald, where the Köterberg has an altitude of 1647 feet. Hydrographically Lippe belongs to the basin of the Weser and is watered by the Werre and several other tributaries of that river. The Weser also touches it on the north for a short distance. The climate is moderate and healthful. With the exception of salt, there are practically no minerals in the principality. Mineral springs are found in some parts. The soil is of indifferent fertility, but agriculture is nevertheless the chief occupation. The land is divided principally into medium holdings, which are protected from subdivision by the right of primogeniture. Of the total area of 121,520 hectares, over one-half is under crop. In 1900, 64,500 hectares (53.1 per cent) were arable land; meadows amounted to 8400 hectares (6.9); pastures, 10,500 (8.6); woodland, 33,500 (27.6). In 1913 there were under rye 14,993 hectares; wheat, 6649; oats, 13,830; potatoes, 7450; hay, 7762. Stock raising is of some importance. In December, 1912, there were 10,212 horses, 38,945 cattle, 7793 sheep, 125,992 swine, and 38,768 goats. Lippe is one of the best-wooded parts of Germany; in 1900 woodland amounted to 33,500 hectares (27.6 per cent of the total area). The greater part of the forests, which are largely deciduous, belongs to the state. The manufacturing industries are undeveloped. Yarn spinning and linen weaving are carried on as house industries to a limited extent. The commerce is also of little importance, the principal exports being agricultural and forest products, yarn, and linen. Native artisans, especially brickmakers, go each spring in large numbers to other parts of Germany and even to foreign countries and return in autumn. The principality is traversed by two state railway lines.

Lippe is a constitutional monarchy, the crown being hereditary in the male line. The constitution (of 1836, revised in 1867 and 1876) provides for a Diet of 21 members elected directly for four years, by voters divided into three grades, according to the amount of taxes paid, each grade electing seven representatives. The executive and judicial parts of the administration are vested in the cabinet. There is a Supreme Court at Detmold, the capital, from which appeals are made to the Court of Appeals at Celle, Hanover. Lippe is represented by one member in the Bundesrat and one in the Reichstag. The budget for 1913–14 showed estimated revenue and expenditure of 2,853,000 and 2,616,000 marks respectively. Public debt, March 31, 1913, 1,278,391 marks. Education is well provided for, and the military affairs are in the hands of Prussia. The population increased from 111,135 in 1871 to 128,495 in 1890, 138,952 in 1900 and 150,937 in 1910 (census of December 1), the increase in the last decade being 8.3 per cent. Of the 217 communes, 208 in 1910 had each less than 3000 inhabitants, or altogether 99,846; and 9 had over 2000 each, or a total of 51,091. The population of Detmold was 14,295. The number of Evangelicals in 1910 was returned at 143,961 (95.38 per cent); Roman Catholics, 5936 (3.93); Jews, 780 (0.52).

History. The Principality of Lippe first appears as an independent country in 1123. Its history was uneventful. In 1807 it joined the Confederation of the Rhine. In 1836 a constitution was promulgated, and the country joined the German customs union. As in most of the German states, its ruler, Prince Paul Leopold Alexander, had to promulgate a new constitution in 1848, but his son Leopold, who came to the throne in 1851, reëstablished in 1853 the old constitution. In the War of 1866 Lippe took the side of Prussia and joined the North German Confederation. In 1871 it became a part of the German Empire. Since then the only disturbing factor has been the conflict regarding the succession which has raged between the houses of Lippe-Biesterfeld and Schaumburg-Lippe. In 1904 the two contending houses decided to submit the question to a court of arbitration. In October, 1905, the court decided in favor of the Lippe-Biesterfeld branch, and Leopold IV (1871–) was made sole ruler of the principality. Consult Schickedanz, *Das Fürstentum Lippe-Detmold* (Hildesheim, 1830), and Triepel, *Der Streit über die Thronfolge im Fürstentum Lippe* (Leipzig, 1903).

LIPPE-SCHAUMBURG, shoum′bụrk. A principality of Germany. See SCHAUMBURG-LIPPE.

LIPPI, lĭp′pė, FILIPPO. The name of two of the foremost Florentine painters of the early Renaissance; the younger is usually called Filippino Lippi. They are known also by the Florentine forms of their names, "Lippo" and "Lippino." Fra FILIPPO (c.1406–69), the father, was the son of a butcher of Florence. His parents died soon after his birth and he was cared for by his aunt Lapaccia, who placed him at the age of eight in the convent of the Carmelites. He scribbled his books with drawings instead of learning from them, and the good and sensible prior yielded to Filippo's wish to become a painter. In 1431, probably with the consent of the brethren, he left the convent for a wider field of activity, but without renouncing his order; for his death is duly recognized in its necrologies. Although he soon obtained the patronage of Cosimo de' Medici, he was usually in trouble, and it required more than once the powerful influence of the Medici to deliver him from the lawsuits and tribulations into which his improvidence and other faults plunged him. In a letter of 1439 to Pietro de' Medici he calls himself the poorest friar in Florence, and begs for a loan to aid him in support of six unmarried nieces. Through the influence of the Medici he received ecclesiastical preferments—among others to be abbot and perpetual rector of San Quirico at Legnaia, near Florence. From this benefice he was removed for forgery and other offenses. In 1452 he received a commission to decorate the chapel and paint the high altar of the cathedral of Prato. In 1455 he bought a house at Prato, and in 1456 he was appointed chaplain to the nunnery of Santa Margherita. He had before this become infatuated with Lucrezia Buti, a nun, who served as the model for St. Margaret in his Madonna della Cintola (Prato Gallery), an altarpiece painted for the nuns. In 1456 Filippo abducted her to his house at Prato, where she was joined by her sister Spinetta and three other nuns. But in 1458 the five returned penitent to the convent, and were in 1459 received back as nuns. Yet Filippo was not deprived of his chaplaincy till 1461. Cosimo de' Medici, to whom he appealed for aid, obtained from Pope Pius II a special brief releasing Filippo and Lucrezia from their monastic vows and allowing them to



FRA FILIPPO LIPPI

"THE CORONATION OF THE VIRGIN." FROM THE PAINTING IN THE ACADEMY OF FINE ARTS, FLORENCE

marry. In 1467 Filippo removed to Spoleto to execute an important commission, the frescoes of the choir of the cathedral, a task which he did not live to finish. He died suddenly Oct. 9, 1469, and was buried in the cathedral, where a stately marble tomb was erected by Lorenzo the Magnificent to contain his body. Vasari's story that Filippo was poisoned entirely lacks confirmation.

As a painter Filippo Lippi ranks highest among the followers of Masaccio, whose pupil he may have been; for the epoch-making frescoes of the Brancacci Chapel were painted for his own convent when Filippo was an inmate. His works, however, show the influence of an earlier Giottesque master, possibly Lorenzo Monaco (q.v.), and reflect the idealism of Fra Angelico. They are warm and transparent in color and are full of human sympathy. Filippo possessed an illustrative talent of the highest order and an unfailing good humor. He was the first to paint a class of pictures characteristic of the Florentine school, in which the Virgin is portrayed as a Florentine mother, and maternal love and childish innocence are the themes represented. His greatest surviving works are the frescoes in the cathedral of Prato (1452–64), which are worthy of comparison with those of Masaccio in the Brancacci Chapel. They represent scenes from the lives of John the Baptist and St. Stephen. Although he is inferior to Masaccio in composition and simplicity, and though he places too much emphasis on subsidiary figures, Fra Filippo excels in individual figures and in the delineation of costume. The frescoes in the apse of the cathedral of Spoleto, representing the life of the Virgin, are the most mature of his works. The grandiose design is by Filippo, but the execution is chiefly the work of his assistant and pupil, Fra Diamante, an inferior artist.

Filippo shows to best advantage in his easel pictures. Among the very best of these is the famous "Coronation of the Virgin," painted in 1441 for the nuns of San Ambrogio, now in the Florentine Academy. This collection, which is richest in his works, possesses also a fine "Madonna with Saints," as does the Louvre; there are charming madonnas in the Berlin Museum, the galleries of Munich and Prato, the Pitti Palace, and the Uffizi, the last mentioned being particularly famous. In the National Gallery, London, are the "Vision of St. Bernard" (1445) and an "Annunciation"; in the Berlin Museum, the "Virgin Adoring the Infant" and "Mary, Mother of Mercies," in which the Virgin is represented with large numbers of kneeling worshipers under her wide-spreading mantle, on either side. The Lateran Gallery (Rome) possesses a "Coronation of the Virgin," an early work; the Museum and churches of Prato, a number of panels, painted during his sojourn there; and the J. Pierpont Morgan collection (Metropolitan Museum, New York), a fine "St. Lawrence, with Sts. Cosmas and Damian and two Donors." Filippo was the head of an important school, and among his pupils were Sandro Botticelli, Benozzo Gozzoli, and his son. Consult: Supino, *Les deux Lippi* (Florence, 1904); E. C. Strutt, *Fra Filippo Lippi* (London, 1906), containing a bibliography; Henriette Mendelsohn, *Fra Filippo Lippi* (Berlin, 1909); Giorgio Vasari, *Lives of the Most Eminent Painters, Sculptors, and Architects,* translated by Gaston du C. de Vere, vol. i (London, 1912).

Filippino Lippi (1457–1504), son of Fra Filippo and Lucrezia Buti, was born at Prato. He acquired the rudiments of art from his father, whom he accompanied to Spoleto. After his father's death he was instructed by Fra Diamente, and in 1471 was apprenticed to Sandro Botticelli. One of his earliest and greatest works was the completion of the frescoes of Masaccio in the Brancacci Chapel (1480–85). He executed the task in a masterly manner, adapting his style to that of Masaccio, although retaining his own individuality. The greater part of "Sts. Peter and Paul Raising the Dead Youth," which Masaccio had begun, is by him, and he also painted the frescoes "Peter and Paul before Nero" and the "Crucifixion of St. Peter." While these works are not as direct and powerful as those of Masaccio, they are nevertheless completed with dignity and restraint.

Filippino's earliest paintings show the influence of his father. This is especially the case in the "Vision of St. Bernard," in the Badia at Florence, executed in tempera, but fine in color as an oil painting and delightful in sentiment. His other works of the early period include a delightful altarpiece in San Michele, Lucca, representing Sts. Roch, Sebastian, Jerome, and Helena; the "Virgin Enthroned" (1486), in the Uffizi, suggesting Botticelli; a fine "Madonna with Saints" and admirable portraits of the donor, Nerli, and his wife, in Santo Spirito, Florence; several madonnas and a "Crucifixion" in the Berlin Museum. To his late period, after the Roman visit, belong "Christ Appearing to the Virgin," Munich Pinakothek; "Adoration of the Kings" (1496), Uffizi; "Meeting of Joachim and Anna," Gallery of Copenhagen; "The Virgin and Child, with St. Joseph and a Child Angel" (c.1500), Altman collection, Metropolitan Museum, New York; the "Marriage of St. Catharine," an altarpiece in San Domenico, Bologna. In 1488 Filippino was commissioned to paint in the church of Santa Maria sopra Minerva, Rome, a cycle of frescoes illustrating the dogmas of the Order of St. Dominic, which he executed with great skill. He was very much impressed by the monuments of Rome, as is especially shown in his use of Renaissance decoration in later works. Fifty years before others he developed a marked baroque style, restless and exaggerated in poses, draperies, and action, and replete with grotesque decorations and broken architectural forms. Among the best of his later works are the frescoes of a tabernacle in Prato; but the most ambitious and impressive are the frescoes of the Strozzi Chapel, in Florence, completed in 1502, with subjects from the history of Sts. Philip and John. These are the most thoroughly baroque of all his achievements.

Filippino inherited from his father a talent for color superior to that of his master Botticelli; his line is softer and more undulating. But his lack of a strong personality prevented an individual development, and rendered him too amenable to foreign influence. His later works, therefore, did not fulfill the promise of his early days. No monograph on Filippino has yet appeared, but consult: A. H. Layard, *The Brancacci Chapel and Masolino, Masaccio, and Filippino Lippi,* published by the Arundel Society (London, 1868); Supino, *Les deux Lippi* (Florence, 1904); Giorgio Vasari, *Lives of the Most Eminent Painters, Sculptors, and Architects,* translated by Gaston du C. de Vere, vol. i (London, 1912).

LIP'PIA (Neo-Lat., named in honor of the French physician and traveler Augustus Lippi). A genus of shrubby and half-shrubby plants of the family Verbenaceæ, including about 90 species, mostly American, and among them the common lemon verbena (*Lippia citriodora*). This was formerly a favorite in old-fashioned flower gardens, especially in England, because of its fragrant leaves. It is a low, tender shrub, deciduous in northern climates, and should be brought into the greenhouse on the approach of frost. It grows readily from cuttings. *Lippia mexicana* has some value in bronchial affections. It contains tannin, quercetin, lippiol, etc. *Lippia nodiflora*, a low-growing species, is cultivated in Arizona and elsewhere as a substitute for grass on lawns.

LIP'PINCOTT, Joshua Ballinger (1813–86). An American publisher, founder of the house which bears his name. He was born in Burlington Co., N. J., removed to Philadelphia about 1828, and entered the book business. In 1836 he organized the firm of J. B. Lippincott & Co. and in 1850 bought the entire business of Grigg & Elliott, one of the best-known firms in Philadelphia. In 1885 the name of the concern was altered to the J. B. Lippincott Company. Upon his death he was succeeded in the presidency by his son, Craige (1846–1911), who was born in Philadelphia, studied at the University of Pennsylvania and in Europe, and entered the publishing house in 1866. In 1911, when Craige died, his younger brother, Joshua Bertram (1857–), who had been vice president since 1886, became president of the concern. He was born at Huntington Valley, Pa., studied for one year at the University of Pennsylvania, and was given an honorary B.A. in 1907.

LIPPINCOTT, Sara Jane (Clarke) (1823–1904). An American author, better known by the pseudonym Grace Greenwood. She was born at Pompey, N. Y., was educated at Rochester, and began to write at an early age. In 1853 she was married to Leander K. Lippincott. Among her works are: *Greenwood Leaves* (1850); *History of my Pets* (1850); *Poems* (1851); *Haps and Mishaps of a Tour in England* (1854); *Merrie England* (1855); *Stories from Famous Ballads* (1860); *Records of Five Years* (1867); *Stories and Sketches* (1893); *Stories for Home Folks* (1903). Consult *Recollections of My Childhood* (New York, 1903). She established *The Little Pilgrim*, a paper for children, and appeared extensively upon the platform as a lecturer and dramatic reader.

LIP'PITT, Henry Frederick (1856–). An American Republican legislator and capitalist, born at Providence, R. I. He graduated from Brown University in 1878; engaged in the cotton-manufacturing business, becoming finally general manager of the Manville Company; and was president of the New England Cotton Manufacturers' Association in 1889. He became interested also in banking, and was director of several corporations, amassing in these and other enterprises a considerable fortune. In 1911 he was elected United States Senator from Rhode Island on the Republican ticket, having advocated in his campaign a high protective tariff. He was known as a regular Republican and succeeded Senator Nelson W. Aldrich (q.v.).

LIPPMANN, lēp'mäN', Gabriel (1845–1921). A French physicist, born at Hallerich in Luxemburg. He entered the scientific department of the École Normale in Paris in 1868, and four years later went to Germany, where he studied physics and chemistry. On his return to Paris he earned the doctor's degree with remarkable theses entitled *Relation entre les phénomènes électriques et capillaires*. He enunciated the principle of the conservation of electricity, and in 1891 discovered a most ingenious method of photographing in colors by the interferential method. (See Color Photography.) He became a professor in the University of Paris in 1883 and director of the physical laboratory in the Sorbonne. In 1908 he was awarded the Nobel prize for physics. Besides a number of memoirs, he published *Cours de thermo-dynamique* (1888); *Cours d'acoustique et d'optique* (1888); *Unités eléctriques absolues* (1899); *L'Enseignement des sciences mathematiques et des sciences physiques* (1904), with others. Consult Ernest Lebon, *Gabriel Lippmann: biographie, bibliographie analytique des écrits* (Paris, 1911), and other works.

LIPP'MANN, Walter (1889–). An American writer on political and social subjects, born in New York City. Graduating from Harvard in 1910, he was for a short time a staff writer on the *Boston Common* and on *Everybody's Magazine* (1910–11); became a contributor to the *American Magazine*, to the *Forum*, to the *Times Book Review*, and to various Socialist publications; and in 1914 joined the board of editors of the *New Republic*. In 1911 he was executive secretary to Mayor Lunn of Schenectady, N. Y. He is author of *Introduction to the Poems of Paul Mariett* (1913); *A Preface to Politics* (1913); *Drift and Mastery* (1914).

LIPPS, lĭps, Theodor (1851–1914). A German psychologist. He was born at Wallhalben, Bavaria; studied at Erlangen, Tübingen, Utrecht, and Bonn; and was professor at Breslau from 1884 to 1894 and after that until 1913 at Munich. He became best known for his contributions to the psychology of space perception and to psychological æsthetics. He published *Grundtatsachen des Seelenlebens* (1883, 1912); *Psychologische Studien* (1885, 1905); *Der Streit über die Tragödie* (1890); *Æsthetische Factoren der Raumanschauung* (1891); *Grundzüge der Logik* (1893, 1912); *Zur Psychologie der Suggestion* (1897); *Raumästhetik und geometrisch-optische Täuschungen* (1897); *Komik und Humor: Eine psychologisch-ästhetische Untersuchung* (1898); *Ethische Grundfragen* (1889; 3d ed., 1912); *Selbstbewusstsein, Empfindung und Gefühl* (1901); *Vom Fühlen, Wollen, und Denken* (1902, 1912); *Leitfaden der Psychologie* (1903; 3d ed., 1909); *Æsthetik* (1903–06); *Naturwissenschaft und Weltanschauung* (1906); *Philosophie und Wirklichkeit* (1907); *Naturphilosophie* (1907). He edited *Psychologische Untersuchungen* after 1905, and, with R. M. Werner, *Beiträge zur Aesthetik* after 1890.

LIPPSTADT, lĭp'stät. A town of Westphalia, Prussia, on the Lippe, 13 miles northeast of Soest (Map: Germany, C 3). It has a considerable grain trade and manufactures iron, soap, thread, felt, vehicles, metal goods, brushes, bricks, tobacco, rope, and brandy. It bakes much of the famous Westphalian rye bread known as pumpernickel. Pop., 1900, 12,534; 1910, 16,360. The town was founded in the twelfth century by the Lord of Lippe. From the seventeenth century it was the joint property of Brandenburg and Lippe. In 1850 Lippe ceded its rights to Prussia.

LIP READING. The art of reading speech by watching the lip movements of the speaker. Lip reading is used by deaf or hard-of-hearing persons, either instinctively or as a result of definite training. It may merely supplement the auditory faculties in those whose hearing is not greatly impaired. Such persons should cultivate the art if tests indicate that the hearing will grow worse. If, on the other hand, there is a prospect that a useful degree of audition will be restored by treatment, efforts should be made in this direction, rather than abandon the ears and depend on lip reading. Authorities are divided as to whether or not lip reading has a deleterious effect on audition by encouraging dependence on the eye rather than the ear. The advocates of the method declare there is no such effect, but that hearing is sometimes benefited. Certain individuals find the strain of watching the lips and trying to hear at the same time very confusing. Others who are so deaf that they fall into a condition of neurasthenia from the constant effort of trying to hear, are much benefited in every way when they learn the art of lip reading. It is evident, therefore, that selection must be exercised in advising the deaf to learn to read the lips, but the method presents many advantages over the use of artificial aids such as ear trumpets, pocket telephones, etc.

The teaching of the art has been brought to a high degree of perfection by Nitchie and others. A certain amount of intelligence and visual alertness on the part of the pupil is essential. The eye must follow both the lips and facial movements, and the mind must be quick to supply what the lips are not able to convey.

Lip reading may be taught either by a teacher or may be mastered by means of practice before a mirror. A skilled instructor should be obtained whenever possible, the mirror being used for practice. The pupil's focus of vision should be the upper teeth, this being the centre from which all lip movements or facial expressions can most readily be seen. The instructor at first repeats short sentences or stories over and over until the pupil can read them from the lips. This is followed by more difficult exercises, based on analysis of the various lip movements. For example, the "lip-shut movement" is used when studying the letters *p*, *b* and *m:* the pupil watches the lips of the instructor, who repeats words containing these letters until he can distinguish them. In using the mirror the pupil commits to memory short anecdotes or stories and exercises, observing narrowly the movements of his own lips as he repeats them before a looking glass.

Many deaf persons become so expert in this art that their infirmity passes unnoticed. General conversation is more difficult for the lip reader than talk between two persons, but even this can be mastered to some degree. Consult: E. B. Nitchie, *Lessons in Lip-Reading* (New York, 1909); id., *Lip-Reading Principles and Practice* (ib., 1912); J. Müller-Wade, *Exercises in Lip Reading for the Adult Deaf* (Springfield, Mass., 1912).

LIPS, Diseases of the. The lips, in common with other portions of the body, may be the seat of tumors, cysts, and deformities. A vesicular eruption, *herpes labialis*, occurs during fevers, acute colds, and gastric disturbances. Cracks and fissures may result from exposure to the sun and wind or in chronic form may be a symptom of congenital syphilis. Superficial ulcers are seen on the mucous surface of the lips in secondary syphilis. Hypertrophy of the upper lip is often observed in strumous children and in persons suffering from chronic nasal catarrh. The fact that the lips are covered with skin on one aspect and mucous membrane on the other, with a mucocutaneous junction, makes their affections at times peculiar. These will be sufficiently described under such articles as Harelip; Nævus; Papilloma; Syphilis; Tumor.

LIPS, lêps, Johann Heinrich (1758–1817). A Swiss line engraver. He was born at Kloten, near Zurich, where he was the pupil of Lavater. Afterward he studied at the academies of Mannheim and Düsseldorf. He twice visited Rome and in 1789 was appointed professor at Weimar through the influence of Goethe, who greatly admired his works. He is noted for his plates after the old masters, whose works he interpreted with skill and finish. He left about 1400 pieces, such as the "Martyrdom of St. Sebastian," after Van Dyck; "The Adoration of the Magi," after Annibale Carracci; "The Bacchanal," after N. Poussin; and the portraits of Goethe, Wieland, and other celebrated contemporaries. He was also a painter in water color.—His son and pupil, Johann Jakob (1790–1833), an engraver, made portraits of Ludwig of Bavaria, Hebel, and others.

LIPSCHITZ, lĭp′shĭts, Rudolf (1832–1903). A German mathematician, born in Königsberg, Prussia. In 1857 he became a privatdocent in Bonn and in 1862 professor at Breslau. Two years later he returned to Bonn as professor, where he remained until his death. He was an extensive contributor to mathematical literature, especially in the higher analysis, including the calculus of variations, the theory of Bernoulli numbers, Bessel's functions, Fourier's series, and the theory of prime numbers. These contributions appeared chiefly in Crelle's *Journal* and in the *Comptes Rendus*. He wrote *Lehrbuch der Analysis* (2 vols., Bonn, 1877, 1880); *Wissenschaft und Staat* (ib., 1874); *Untersuchungen über die Summen von Quadraten* (ib., 1886); *Bedeutung der theoretischen Mechanik* (Berlin, 1876).

LIPSCOMB, lĭps′kŭm, Andrew Adgate (1816–90). An American clergyman and educator, born at Georgetown, D. C. He entered the ministry of the Methodist Protestant church, joining the Maryland conference in 1835, and for some time was president of the Alabama conference. Compelled by ill health to retire from the ministry, he founded in 1849 the Metropolitan Institute for Young Ladies at Montgomery, Ala. From 1856 to 1859 he was president of the Tuskegee Female College of the Methodist Episcopal Church South and from 1860 to 1874 chancellor of the University of Georgia. In 1875 he was elected professor of philosophy and criticism in Vanderbilt University. He became professor emeritus several years before his death. He was the author of *Studies in the Forty Days between Christ's Resurrection and Ascension* (1885) and *Studies Supplementary to the Studies in the Forty Days between Christ's Resurrection and Ascension* (1886).

LIPSIUS, lĭp′sĭ-ụs, Ida Marie (1837–). A German writer on music, known by her pseudonym, La Mara. A sister of the classical philologist Justus Hermann Lipsius, she was born in Leipzig and wrote several sketches of travel, *Im Hochgbirge* (1876), *Sommerglück* (1881), and *Im Lande der Sehnsucht* (1901). Her musical publications include the essays *Musikalische Studienköpfe* (5 vols., 1868–82; 11th ed., 1913) and *Klassisches und Romantisches aus der Tonwelt* (1892); the collection of *Gedanken berühmter Musiker über ihre Kunst* (1876), and of *Musikerbriefe aus fünf Jahrhunderten* (1886); editions of Liszt's letters (8 vols., 2d ed., 1893–1905), of his correspondence with Von Bülow (1898) and Charles Alexander, Grand Duke of Saxony (1908), and of Berlioz's letters to Princess Sayn-Wittgenstein (1903); and a translation into German of Liszt's *Chopin* (3d ed., 1910). She published also *Beethovens unsterbliche Geliebte: Das Geheimnis der Gräfin Brunswik und ihre Memoiren* (1909); *Liszt und die Frauen* (1911).

LIPSIUS, Justus (1547–1606). The Latinized form of Joest Lips, a celebrated philologian and humanist, born at Oberryssche in Brabant. He studied law and humanism at the Jesuit College in Cologne and at Louvain. In 1567 he published his essays, *Variarum Lectionum Libri Tres*, which secured him the favor of Cardinal Granvella, who took him to Rome and made him his secretary. From 1569 to 1572 he led the life of a wandering scholar in the Low Countries, Germany, and Austria, turning Lutheran in the latter year to take the chair of history at Jena, where he remained for two years. After living for some time at Cologne, Louvain, and Antwerp, he became in 1579 professor of history at Leyden, embracing at the same time the Calvinistic faith. In 1590 he became reconciled with the Church and received the chair of Latin at Louvain (1592). There he remained till his death. Probably the greatest authority of his age on Roman antiquities, Lipsius contributed greatly to the development of the study of the language and history of ancient Rome by a large number of editions of the Latin historians and philosophers, preëminent among which is the monumental edition of Tacitus, which has remained a standard to the present day (1st ed., Antwerp, 1574; 6th ed., corrected by the author, 1605). He also published editions of Velleius Paterculus, Valerius Maximus, and Seneca, besides numerous original contributions dealing with the material and intellectual life of the ancient Romans. Among these are: *De Amphitheatro* (1584); *De Cruce* (1593); *De Militia Romana* (1595); *De Vesta et Vestalibus Syntagma* (1603). His philosophical views, which were those of the Stoics, were embodied in the *De Constantia* (1584) and the *Manuductio ad Stoicam Philosophiam* (1604). His correspondence has been published in part. His *Opera Omnia* appeared at Antwerp in 1637. Consult Galesloot, *Particularités sur la vie de Justus Lipsius* (Bruges, 1877), and Amiel, *Un publiciste du 16ème siècle: Juste Lipse* (Paris, 1884).

LIPSIUS, Justus Hermann (1834–). A German classical scholar, born at Leipzig, professor in the university of his native city after 1869. He was editor of Andocides (1888) and of Demosthenes, *On the Crown* (1884), reviser of Meier and Schömann's *Der attische Prozess* (2 vols., Berlin, 1883, 1887) and of Schömann's *Griechische Altertümer* (2 vols., ib., 1897, 1901), and author of *Attisches Recht und Rechtsverfassung* (1905–12). He wrote numerous philological papers and edited *Leipziger Studien zur klassischen Philologie*.

LIPSIUS, Richard Adelbert (1830–92). A German theologian, brother of the preceding, born at Gera. He studied at Leipzig, was appointed professor of theology there, and afterward at the universities of Vienna, Kiel, and Jena (1871). In 1874 he was nominated a member of the Weimar Synod. Lipsius belongs to the moderate representatives of liberal theology; in historical research he recognizes the propriety of scientific criticism, and on matters of dogma sides with Kant, who requires harmony between revelation and the actual existence of the world. His *Lehrbuch der evangelischprotestantischen Dogmatik* (3d ed., 1893) is noteworthy. His other contributions to theological literature, among many, include: "Der Gnosticismus," in Ersch and Gruber's *Encyclopädie* (1860); *Die Quellen der ältesten Ketzergeschichte* (1875); *Philosophie und Religion* (1885); *Unser gemeinsamer Glaubensgrund im Kampfe gegen Rom* (1890).

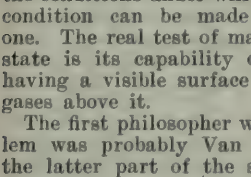
LIP'SOS (anc. *Lepsia*). A small island in the Ægean Sea, off the coast of Asia Minor, one of the Dodecanesia (q.v.) group, 6 miles southeast of Patmos.

LIP'TON, Sir Thomas Johnstone (1850– .) A British merchant and yachtsman, born in Glasgow, Scotland, of Irish parentage. Coming to the United States when 15 years old, he worked in New York City as a clerk for a short time, and then for two years in the South —in New Orleans as a street-car driver and in South Carolina as a laborer on rice plantations. He returned to Glasgow and in 1876 opened there a grocery store. From this small beginning his business expanded and came to include many stores in Great Britain, as well as tea, coffee, and cocoa plantations in India, rubber estates in Ceylon, and a large pork-packing establishment in Chicago. He gave liberally to many charitable undertakings, e.g., $100,000 in 1897 to the Alexandra Trust Fund for providing cheap dinners for working people. From boyhood he was an enthusiastic sailor, and in his later years he became famous for his attempts to win back the *America's* Cup. (See Yacht and Yachting.) Lipton was knighted in 1898 and was made Baronet in 1902. In 1915 he used his steam yacht to carry nurses and supplies to Servia for sufferers from the European War.

LIQUA'TION, or **ELIQUATION.** In metallurgy the process of separating metals differing in fusibility, by applying heat sufficient to melt one and leave the other in the solid state. It is a process of antiquity, having been used up to 1836 at Mansfeld, Prussia, in the treatment of argentiferous copper and lead ores. Lead containing antimony and some other metals may be partially freed from them and prepared for other treatment by a process of liquation. Antimony may be removed from its ores by applying a heat which will cause the molten metal to flow from the ore, leaving the latter intact by reason of its much higher melting point. Copper and lead alloys may also be separated in the same way. See Silver.

LIQ'UEFAC'TION OF GASES (Lat. *liquefactio*, from *liquefacere*, to make liquid, from *liquidus*, liquid, from *liquere*, to be fluid + *facere*, to make). Matter exists in different forms as solids, liquids, and gases, which may be roughly discriminated: A solid is matter in such a form that it keeps both its size and shape under all ordinary conditions; a liquid has, as a rule, a definite volume, but will assume the shape of any vessel in which it is placed; while, if allowed to fall freely so as to form drops, these are spherical; a gas, on the other hand, will take both the shape and volume of the solid vessel which contains it. Water in these three forms is ice, ordinary water, and steam. Every one is familiar with the fact that it is easy to make any one of these forms of water pass into any other. Thus, in nature, we have the formation of ice, hail, and snow, all of which in turn melt and form water or else vaporize and form steam. Similarly we have the water evaporating from the surfaces of lakes and oceans, and the reverse process, the formation of rain and dew. These changes of matter from one form into another are called "changes of state," and the subject "liquefaction of gases" deals with the conditions under which matter in the gaseous condition can be made to assume the liquid one. The real test of matter being in the liquid state is its capability of forming drops or of having a visible surface of separation from the gases above it.

The first philosopher who considered this problem was probably Van Helmont, who lived in the latter part of the sixteenth and the early part of the seventeenth century. He introduced into science the word "gas" and distinguished between what he called "gases" and "vapors," saying that the latter could be condensed into the liquid state, while the former could not. This distinction has persisted in science up to within recent years. As early as the first year of the nineteenth century Dalton, the great English chemist, made the statement: "There can scarcely be a doubt entertained respecting the reducibility of all elastic fluids of whatever kind into liquids; and we ought not to despair of effecting it in low temperatures, and by strong pressures exerted on the unmixed gases." But up to the time of Faraday comparatively little experimental work has been done.



APPARATUS OF FARADAY FOR THE LIQUEFACTION OF CHLORINE, SULPHUROUS ACID GAS, ETC.

The substances which by their reaction produce the gas are placed in one end of a bent glass tube, and the open end is then sealed. If these reacting substances are in the end *a*, this is heated, thus causing the active evolution of the gas, while the other end, *b*, is cooled as far as necessary or possible. Thus, the gas in the end *b* is under high pressure and at a low temperature.

In 1823, at the suggestion of Sir Humphry Davy, Faraday began a series of experiments which ended in his securing a general method for the liquefaction of gases which he applied to chlorine, sulphurous acid, carbonic acid, cyanogen, and many others. This method was to generate the gases in large amounts in a small space so that the pressure was great and then to cool the gases, while under this high pressure, to a sufficiently low degree. In 1845 Faraday published a second series of researches describing his observations on gases which he had succeeded in liquefying, by making use of temperatures much lower than those which he had been able to obtain in his first investigation. He thus succeeded in liquefying all gases then known, with the exception of hydrogen, oxygen, nitrogen, nitric oxide, and marsh gas. He subjected oxygen to a pressure of about 1000 pounds to the square inch, but it showed no signs of liquefaction. In speaking, however, of his efforts to liquefy these so-called "permanent gases," he states: "Further diminution of temperature and improved apparatus for pressure may very well be expected to give us these bodies in the liquid or solid state."

This hope of Faraday's was rendered much more certain by the work of Andrews on the properties of carbon dioxide under varying temperatures and pressures which began in 1863 and was published finally in 1869. The chief result of Andrews's work was the proof that for carbon dioxide, and probably therefore for other gases, there was a certain temperature, different for different substances, below which the gas must be cooled before any amount of pressure, however great, would cause it to liquefy. This temperature is called the "critical temperature." It was evident, then, that the explanation of all previous work on the liquefaction of gases which had been successful was the fact that the experimenters had used gases whose critical temperatures were not lower than the lowest temperatures available in laboratories; while the lack of success in the attempts to liquefy the permanent gases was owing to the fact that the critical temperatures of these gases were extremely low. The problem, then, to liquefy the permanent gases took the form of an investigation as to the means of securing extremely low temperatures.

Methods for the production of low temperatures may be conveniently divided into four classes.

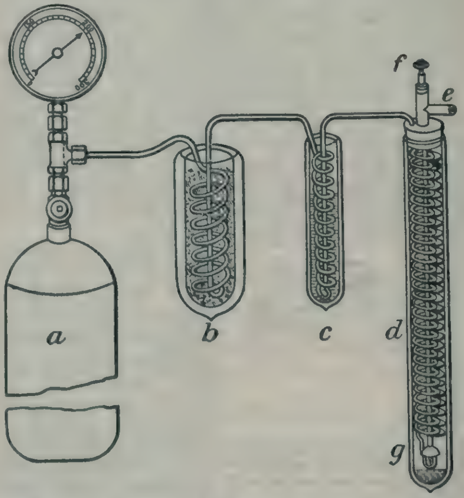
The Use of Freezing Mixtures. It has been known for many years that a mixture of common table salt and ice produced a temperature many degrees below that of melting ice when pure, viz., 0° C. The lowest temperature available by using this salt and ice, when mixed in suitable proportion, is −22° C. It was found, however, by Thilorier that by mixing solid carbon dioxide, which he was able to secure by a method to be described presently, and ordinary sulphuric ether the mixture had a temperature of −110° C. This mixture, always known as "Thilorier's mixture," was first studied by him in 1834 and formed for many years the only means of securing extremely low temperatures. In fact, there is at the present time no freezing mixture in use that gives a temperature lower than this.

The Method of Evaporation. It was recognized by all the investigators in the subject of heat, notably by Leslie and Black, that when a liquid evaporated rapidly the surrounding objects, and especially the solid vessels which contained the liquid, gave up a great deal of heat, and that thus their temperature fell. This is owing to the fact that it requires heat to produce evaporation; and so, if evaporation ever takes place, a definite amount of heat must be taken away from the neighboring matter. In this manner Leslie and Wollaston showed that water could be frozen by means of its own evaporation. The first use, however, of this fact concerning the low temperatures produced by evaporation made to secure liquefaction of gases was in the investigation of Bussy in 1824, who observed that if liquid sulphurous acid was made to evaporate rapidly he could get a temperature as low as −65° C., and, using this method, he liquefied chlorine, ammonia, and cyanogen, and in fact solidified the last-named gas. This method of securing low temperature immediately came into general use and is still used in many processes.

Method of Expansion. It was noted by investigators early in the nineteenth century, if not before, that when a gas under high pressure is allowed to expand into the open air or to escape through a small opening, it experiences a drop in temperature; and the laws concerning this fall were studied by Gay-Lussac and many others. The first practical use, however, of the method with reference to liquefying gases was made in 1834, while Thilorier liquefied and even solidified carbonic-acid gas by allowing it to expand suddenly. He made use further of the low temperatures thus obtained by expansion in studying many physical properties of bodies. This method was extended also by Mitchell in 1839 and was used practically by Dr. John Gorrie, who in 1849 constructed an ice machine based on the low temperature produced by the expansion of compressed air. This method of first compressing a gas, causing it to be cooled to a temperature as extreme as possible by ordinary means, and then allowing it to expand suddenly is the standard method now in use in all machines made for liquefying gases. There are two processes involved in this production of low temperature by expansion. It is evident that, if a gas compressed in a cylinder is allowed to escape through a small opening, work will be done both in overcoming the pressure of the air and also in giving kinetic energy to the rapidly escaping gas. This work must be done by the gas itself which stays behind and, as it were, pushes out the other gas; and therefore its temperature falls. There is a second reason, however, depending upon the fact first discovered in the experiments by Joule and Thomson (later Lord Kelvin). This is that there is a change in the intrinsic energy of a gas when it occupies a small volume and its molecules are thus close together, and when it fills a larger volume and its molecules are far apart. It is observed that if oxygen or nitrogen or any of the ordinary gases, with the exception of hydrogen, is allowed to expand, doing no external work, the temperature of the gas falls. In the case of hydrogen it was found that at ordinary temperatures if "free" expansion takes place, there being no external work done, the temperature rises. However, if the initial temperature of the hydrogen is sufficiently low, then the expansion will produce a further *fall* in temperature. Thus, when any gas is under pressure at a low temperature and is allowed to expand by escaping into a space at a lower pressure, this temperature will fall; and if it is under sufficiently high pressure, the gas may thus be liquefied.

The Regenerative Method. In this method gas under pressure is allowed to expand, and then, having thus been cooled, it is driven back and made to circulate round the outside of the vessel which contains the compressed gas. In this manner the temperature of the compressed gas is being brought down continually lower and lower, until, finally, it is at a temperature so low that any further decrease in temperature will produce liquefaction. This method was first used by Siemens in 1857. The first suggestion that this principle should be used in the scientific study of the liquefaction of air and other gases was due to Edwin J. Houston in 1874. Since this time the regenerative principle has been used by several investigators, notably by Prof. Kamerlingh Onnes in 1894 and by Professor Dewar in 1895. In all the commercial forms of machines this principle forms one of the essential features of the apparatus.

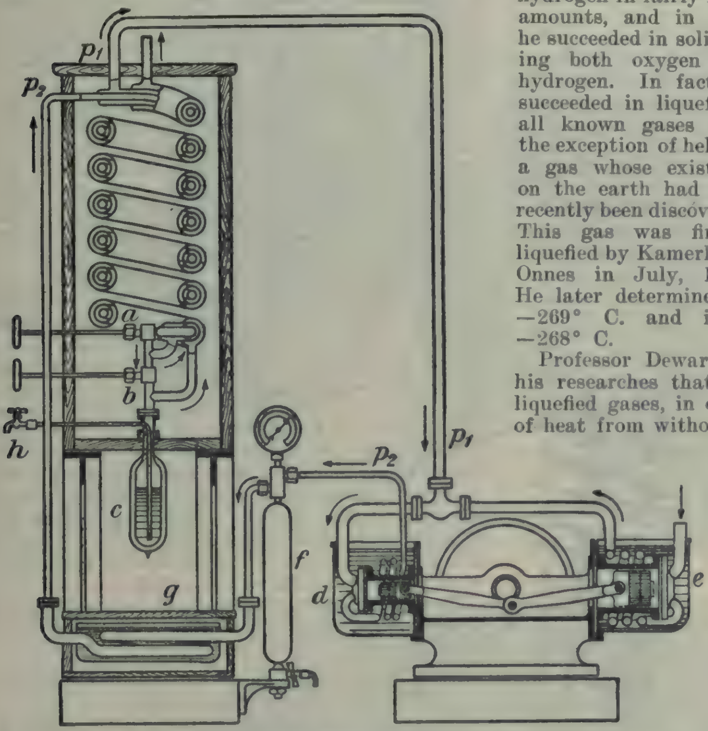
After the publication of Andrews's researches in 1869, work proceeded very rapidly, and finally, in December, 1877, oxygen was liquefied by two investigators working independently—Cailletet, one of the greatest ironmasters of France, experimenting at his works at Châtillon-sur-Seine, and Pictet, a maker of machines for manufacturing ice, working at Geneva. The latter liquefied oxygen at a pressure of 320 atmospheres and a temperature of —140° C., producing his low temperature by a combination of the methods of evaporation and expansion; and the former compressed his oxygen and carbon monoxide to a pressure of 200 atmospheres, cooled it to a temperature of about —28° C., and then allowed it to expand suddenly. Cailletet succeeded in his experiments on December 2, and Pictet succeeded in his December 22; an announcement was made to the world of the results of both at the meeting of the French Academy on Dec. 24, 1877. Neither of these observers obtained oxygen in any large amounts or in a static condition, practically only a mist being formed. Cailletet proceeded to liquefy both nitrogen and air; but both he and Pictet secured only the faintest evidence of the liquefaction of hydrogen. The first to obtain oxygen, nitrogen, and carbon monoxide in fairly large amounts were Wroblewski and Olszewski, who began their work at Cracow in 1883. The method used by them was simply to produce a low temperature by a combination of freezing mixtures and the evaporation of liquids, and under these conditions if the pressure of the gas is sufficiently great it is liquefied. Experiments were made on hydrogen, but their greatest success was simply to obtain a slight froth and other signs of ebullition; they failed to secure any drops of the liquid. These observers were



APPARATUS OF DEWAR FOR THE LIQUEFACTION OF HYDROGEN.

a represents one of the cylinders containing hydrogen under the pressure of about 200 atmospheres; *b* is a Dewar flask containing liquid carbonic acid evaporating under exhaustion; *c* is a similar flask containing liquid air; *d* is the regenerative coil through which the gas under pressure is passed, and over which, after being cooled by expansion, it is drawn; *g* is the pin-hole nozzle through which the compressed gas expands, escaping at the rate of about 15 cubic feet per second; *e* is an opening through which the gas can be withdrawn and again compressed; *f* is the valve by which the size of the pin-hole nozzle *g* is regulated. The flask containing the regenerative coil is a doubly silvered vacuum vessel, and is surrounded with a space kept below — 200° C. The liquid hydrogen, when formed, drops from this vacuum vessel into another which is doubly insulated by being surrounded with a third vacuum vessel.

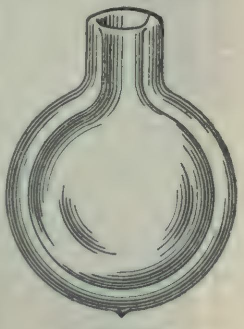
the first to make a careful study of the physical properties of gases at low temperatures, measuring their critical temperatures and pressures, their boiling points, isothermals, etc. Olszewski succeeded in solidifying a number of gases, especially carbon monoxide and nitrogen, and measuring their freezing points. He was the first to make use of the evaporation of liquid oxygen and liquid air as a means of producing low temperatures.



LINDE APPARATUS FOR THE LIQUEFACTION OF AIR.

The most important parts of the Linde machine, as described in the specifications of the makers, are the two-cylinder air compressor and the countercurrent interchanger. The former is driven by means of a belt, from an electric or other motor. The interchanger consists of a triple spiral of three copper tubes wound one inside the other. The compressed air at the temperature of the coil *g* and at about 200 atmospheres' pressure passes through the inmost tube of the spiral from top to bottom, and passes out at the lower end through a valve *a* under a pressure of some 16 atmospheres. It returns upward through the annular space between the inner and middle pipes and is then again raised to a pressure of 200 atmospheres by the smaller cylinder *d* of the compressor and then begins the same cycle over again. The large cylinder *e* of the compressor pumps a small amount of air from the atmosphere into the suction pipe of the small cylinder, that is to say, at 16 atmospheres. A similar quantity of air must therefore leave the cycle at another point so that the pressure may remain constant. This escape of gas takes place at the lower end of the countercurrent interchanger immediately after the discharge from 200 to 16 atmospheres, so that a controllable amount of air issues from 16 atmospheres to 1 atmosphere through a second valve *b* and escapes through the outer annular space of the triple copper tube. Part of this air, when the apparatus is cooled down to the temperature of liquefaction, then becomes liquefied and collects in a Dewar flask, *c*, which is fixed to the lower end of the countercurrent interchanger. By means of a little pipe reaching to the bottom of the glass vessel the liquid may be run off through the cock *h*. That part of the air issuing from the second valve which is not liquefied leaves the apparatus, escaping through the space between the middle and outside pipes of the spiral into the atmosphere. A small quantity of water is continually injected into the suction pipe of the low-pressure cylinder in order to fill the clearance and to lower the final temperature of compression. This water, together with the moisture contained in the air, must be as far as possible completely separated out, so as to avoid stopping up the inside coil with ice. This is done first of all by means of a water separator, *f*, which holds back water carried over with the air in mechanical suspension, and secondly by means of an iron pipe in the form of a coil, *g*, which is cooled down to a few degrees below zero by a freezing mixture of ice and chloride of calcium, and freezes out the small quantities of water vapor contained in the highly compressed air until only traces remain.

The greatest advances made in recent years in the field of low-temperature research are undoubtedly those due to the investigations of Professor Sir James Dewar at the Royal Institution, London, and of Professor Kamerlingh Onnes at the University of Leyden. They have succeeded in obtaining liquid oxygen, nitrogen, and air in practically unlimited amounts. Dewar was able to solidify air as early as 1893; on May 10, 1898, he obtained liquid hydrogen in fairly large amounts, and in 1899 he succeeded in solidifying both oxygen and hydrogen. In fact, he succeeded in liquefying all known gases with the exception of helium, a gas whose existence on the earth had only recently been discovered. This gas was finally liquefied by Kamerlingh Onnes in July, 1908. He later determined its boiling point as being −269° C. and its critical temperature as −268° C.



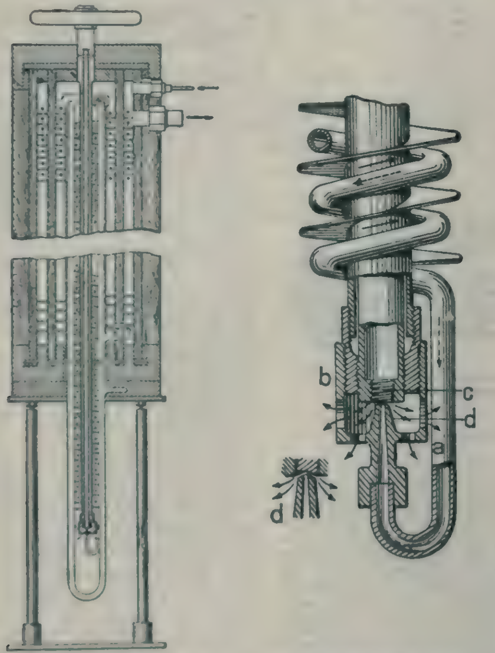
DEWAR BULB.

Professor Dewar discovered in the course of his researches that the best vessel for holding liquefied gases, in order to guard against access of heat from without, was a double-walled glass bulb, the space between the walls being completely exhausted of air, and the glass being silvered like a mirror so as to reflect radiation. This vessel is called the "Dewar bulb." (This is the principle of the ordinary "thermos bottle.") Important simplifications in the apparatus of Dewar for the liquefaction of hydrogen have been made by Travers and others.

As soon as it was found possible to liquefy gases with comparative ease, several machines were made in order to obtain liquefied air for commercial purposes. The most important of these are those invented by Linde in Germany, Hampson in England, and Tripler in America. These machines were all invented at about the same time (early in 1895), and all made use of the same principle, viz., the regenerative method. With these machines liquid air can be obtained in almost unlimited quantities and in a comparatively short time.

Innumerable uses have been found for liquefied gases, both in scientific investigations and in industrial applications. The low temperatures which can thus be obtained are useful in many chemical experiments, and also in many spectroscopic investigations where it is essential to secure pure gases. Liquid carbonic acid is used in the preparation of all kinds of aërated waters, viz., soda water, and also in the manufacture of salicylic acid. Enormous quantities of liquid sulphurous acid, which is used for many purposes, are now prepared for the market. Liquid nitrous oxide is used as an anæsthetic for minor surgical operations, especially in dentistry. Liquefied gases are used in the operation of most ice-machine plants. Liquid oxygen can be obtained commercially and is used extensively in hospitals. It has been thought that liquid air would be used as a motive power, but so far all attempts to control it have failed.

At temperatures as low as those of liquid air and solid hydrogen all the ordinary properties of matter would be expected to change, and a careful study of these changes has been made by many investigators, notably by Professor Dewar. A few facts may be noted here. The electrical resistance of metals decreases as the temperature is lowered, and in many cases the relative order of metals with reference to their electrical resistance is changed at low temperatures. Thus, at ordinary temperatures silver is a better conductor than copper, whereas at −200° the reverse is true. (See RESISTANCE.) The thermoelectric properties of bodies change to a marked degree. The magnetic moment of magnets is increased by 30 or 40 per cent as the temperature is lowered to −200°. The elastic constants of bodies increase by as much as four or five times when the temperature is lowered from +15° to −182°. Rubber becomes brittle. Changes of color often take place, the original hue, however, returning in all cases when the temperature is restored. There are many curious phosphorescent phenomena at low temperature. Milk becomes highly phosphorescent. An egg shines as a globe of blue light. Chemical affinity is almost completely destroyed by cold; phosphorus, sodium, and potassium when placed in liquid oxygen remain absolutely unaffected. Photographic films retain only about one-fifth of their ordinary sensitiveness to light. The power of charcoal to absorb gases is greatly increased at low temperatures, and this fact is made use of in securing high vacua in closed bulbs.



APPARATUS OF HAMPSON FOR THE LIQUEFACTION OF AIR.

The gas to be liquefied is introduced through the small tube at the top under a pressure of about 120 atmospheres entering at ordinary room temperature. This tube is extended downward in a spiral wound round the central column; and at its lower end there is an expansion valve which is regulated from above by means of a screw. (The details are shown in the second cut.) The gas, cooled by expansion, passes up through the apparatus and out again by the large pipe shown at the upper end. The coil *a*, carrying the compressed gas, ends in the jet *d*, which can be opened or closed by the screw *c*, regulated from above. The path of the gas after expansion is shown by the arrows. The regenerative principle is evident.

One of the most important commercial applications of low temperatures is the preparation of oxygen and nitrogen on a large scale. Air is liquefied, and then by a process of fractional distillation the two gases are separated. The nitrogen thus produced is used in the manufacture of ammonia, cyanamide, etc.; and the oxygen has many commercial applications.

Some interesting experiments have been tried dealing with vital phenomena at low temperatures. Warm-blooded animals, of course, perish at comparatively high temperatures, but it was found that bacteria can bear with impunity almost any temperature, however low. Sterilization does not result even after an exposure for one hour to a temperature of −182°; the germinating power of seeds is also unimpaired; blood, meat, and milk when sealed in glass tubes undergo putrefaction in the ordinary course. In other words, life can exist at 21° from the absolute zero, and probably much nearer, under conditions which nevertheless almost completely stop chemical and molecular action.

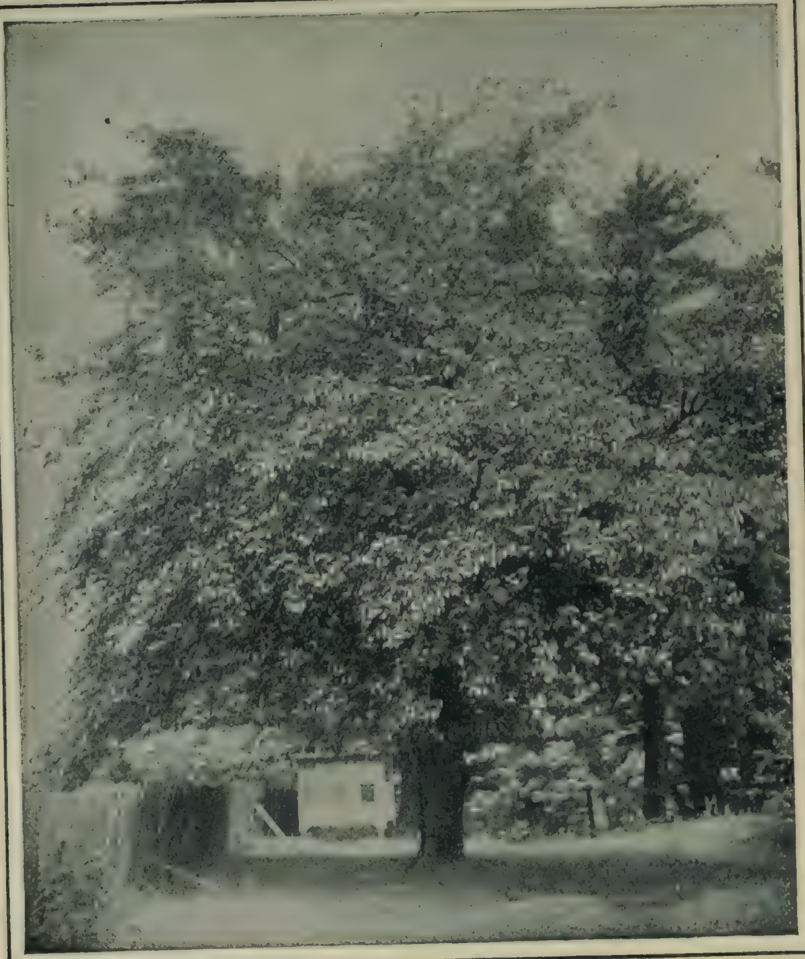
It may be interesting to note in tabular form a few of the physical constants of the gases and their liquids:

SUBSTANCE	Critical temperature	Boiling point at atmospheric pressure	Freezing point	Color of liquid
Alcohol	+243.6° C.	+78.3° C.	−130° C.	Colorless
Ammonia	+130	−33.7	−75	"
Argon	−121	−187	−189.6	"
Carbon dioxide	+31.3	−78.2	−65	"
Carbon monoxide	−139.5	−190	−211	"
Fluorine	−120 (?)	−187	−233	Yellow
Hydrogen	−243	−253	−247	Colorless
Nitrogen	−146	−195.5	−215	"
Oxygen	−118.3	−185	−235	Pale blue
Water	+358.1	+100	Zero	Colorless

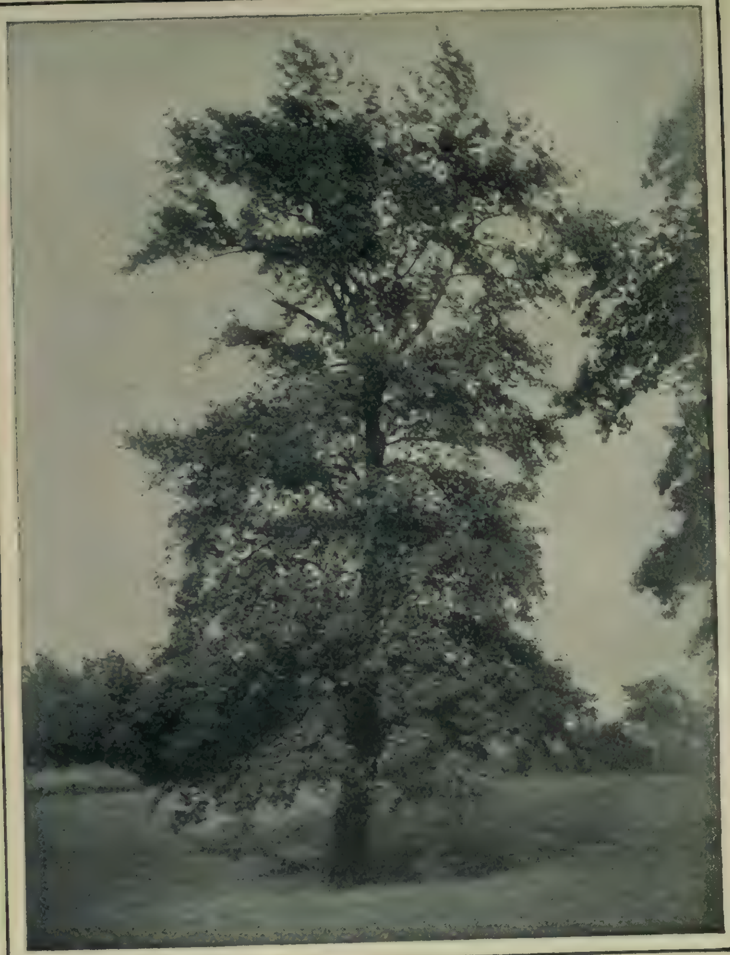
In connection with these figures it should be stated that there are several lines of argument, based upon physical experiments, which lead scientists to believe that it is impossible for us to obtain by any physical means a temperature lower than about −273° C. This temperature is called "absolutely zero," and the nearest approach made to it by any experiments so far performed has been in the work of Onnes, who has claimed to have reached a temperature less than 2° above absolute zero.

Bibliography. A complete history of the subject of liquefaction of gases will be found in W. L. Hardin, *The Rise and Development of the Liquefaction of Gases* (New York, 1899). There is also an interesting article by A. M. Clerke on "Low Temperature Research at the Royal Institution, 1893–1900," in the *Proceedings of the Royal Institution of Great Britain*, vol. xvi (London, 1901); T. O. Sloane, *Liquid Air* (2d ed., New

MULBERRY AND LIQUIDAMBAR



MULBERRY (Morus alba).



LIQUIDAMBAR (Liquidambar styraciflua).

York, 1899); W. C. D. Whetham, *Recent Development of Physical Science* (Philadelphia, 1904); G. Claude, *Liquid Air, Oxygen, Nitrogen* (ib., 1913). For Dewar's work, consult *Proceedings of the Royal Institute* from 1878 to the present time (London); and for Onnes's, see *Communications from the Physical Laboratory at the University of Leyden* (Leyden).

LIQUEUR, lê-kẽr′ (Fr., liquor). The name given to any alcoholic preparation which is flavored or perfumed and sweetened to be more agreeable to the taste. Many of the most famous liqueurs were first made by monks as cordials for the sick, and the secret of their composition has been transmitted from one generation to another in convents and monasteries. *Aniseed cordial* is prepared by flavoring weak spirit with aniseed, coriander, and sweet fennel seed, and sweetening with clarified sirup of refined sugar. *Clove cordial*, much sold in the London ginshops, is flavored with cloves, bruised and colored with burned sugar. *Peppermint*, a common liqueur, especially among the lower classes of London, consists of the ordinary sweetened gin, flavored with essential oil of peppermint, which is previously rubbed up with refined sugar.

Among the other commercial liqueurs, the following are the chief varieties: absinthe, anisette, Benedictine, cassis, chartreuse, crème de menthe, crème de rose, crème de vanilla, etc., curaçoa, kirschwasser, kümmel, maraschino, noyau, pomeranzen, ratafia, trappistine, usquebaugh, vermouth. Most of these are elsewhere described under their respective names. The composition of some of the well-known liqueurs, as given by König, is shown in the accompanying table:

COMPOSITION OF VARIOUS LIQUEURS

LIQUEURS	Specific gravity	Alcohol by volume	Alcohol by weight	Extract	Cane sugar	Other extractives	Ash
Absinthe	0.9116	58.93	....	0.18	....	0.32	....
Benedictine	1.0709	52.00	44.4	36.00	32.57	3.43	.043
Ginger	1.0481	47.5	40.2	27.79	25.92	1.87	.141
Crème de menthe	1.0447	48.0	40.7	28.28	27.63	0.65	.068
Anisette of Bordeaux	1.0847	42.0	35.2	34.82	34.44	0.38	.040
Curaçoa	1.0300	55.0	47.3	26.60	28.50	0.10	.040
Kümmel	1.0830	33.9	28.0	32.02	31.18	0.84	.058
Peppermint	1.1429	34.5	28.6	48.25	47.35	0.90	.068
Swedish punch	1.1030	26.3	21.6	36.61	....	....	....

In recent years there has been great objection made to the use of absinthe on account of its very injurious effects, and its importation and shipment in interstate commerce were prohibited in the United States in 1912. Consult also Mew and Ashton, *Drinks of the World* (New York, 1892), and Sadtler, *Industrial Organic Chemistry* (Philadelphia, 1901).

LIQ′UID (Lat. *liquidus*). A consonant pronounced by the closure of the vocal organs greater than is required in the utterance of the closer vowels, but less than is demanded by the mute consonants. The term was originally used by Greek grammarians as early as the second century B.C. because of the smooth and flowing sound of these letters and the pliancy with which they coalesce in pronunciation with a preceding mute. Transferred into Latin as *liquidæ* (a literal translation of the Greek ὑγρά), it has since remained in use. The liquid consonants are *l, m, n, r*. But this classification is no longer adhered to by phoneticians. A somewhat similar term is the French *mouillé*, literally 'wet,' applied to the palatalized pronunciation of *l* and some other consonants.

LIQUID AIR, LIQUID HYDROGEN, ETC. See LIQUEFACTION OF GASES.

LIQ′UIDAM′BAR (Neo-Lat., from Lat. *liquidus*, liquid + ML. *ambar*, *ambra*, amber, from Ar. *'anbar*, ambergris). A genus of trees belonging to the family Hamamelidaceæ (witch-hazel family). It includes four species, distributed as follows: *Liquidambar formosana* in China, *Liquidambar macrophylla* in Central America, *Liquidambar orientalis* in Asia Minor, and *Liquidambar styraciflua* in North America. The trees are tall and remarkable for their fragrant balsamic products. *Liquidambar styraciflua*, red gum, or sweet gum, is found from Connecticut south to Florida and west to Texas and Mexico. In the South, where the tree is common, it attains a height of 100 feet or more. The timber, which is often called satin walnut in the markets, is valuable. A resinous gum exudes from the tree similar to the storax of the Orient.

LIQUIDAMBAR.

LIQ′UIDAT′ED DAMAGES. The sum agreed upon by the parties to a contract, to be paid by either in case of his default to the other, as the measure of compensation for the loss occasioned by the breach. The right of the parties to a contract to anticipate that there may be a breach by one of them, either with or without good cause, and to estimate and determine in advance what will be a fair and reasonable compensation to the injured party, is recognized and protected by the courts. The chief concern of the courts in the interpretation of agreements of this character is to determine whether the sum thus named is in fact the result of an honest effort to fix a sum which will approximately make good the loss which may be suffered in case of breach, or whether it is out of all proportion to the probable amount of damages sustained, and therefore in the nature of a penalty. In the latter case it is void, as it is deemed contrary to public policy to permit parties to stipulate for a penalty. The courts will give great weight to the intent of the contracting parties, as far as that can be ascertained by considering the language employed by them, and the surrounding circumstances which induced them to insert such a provision. It is common to fix the amount of damages for delay in case of building operations, and it is in this class of cases that the courts have been most lenient in the construction of these stipulations. The advantage of thus fixing the damages in advance is that the aggrieved party is spared the trouble and possible expense of offering proof of the items of his damages at the trial, and that the uncertainty as to what a jury might consider adequate is avoided. Generally speaking, when damages can be easily ascertained by computation merely, and the amount named as liquidated damages is greatly in excess of that amount, or where the contract is for the payment of money only, and a sum in excess of what would be the highest rate of legal interest is fixed, the courts will regard it as a penalty. The courts will not disregard such an agreement merely because the sum named will be liberal compensation for the probable loss sustained, but only when it seems grossly out of proportion to the loss. However, these agreements are regarded with suspicion. Where the intention, as expressed, is ambiguous, and there is doubt as to whether the sum is to be deemed as liquidated damages or as a penalty, the courts incline towards the latter construction. See DAMAGES; PENALTY; and consult the authorities referred to under DAMAGES.

LIQ′UIDS, GENERAL PROPERTIES OF. See HYDROSTATICS; MATTER.

LIQ′UORICE. Various shrubby plants. See LICORICE.

LIQ′UORS (Lat. *liquor*, fluid, from *liquere*, to be fluid), FERMENTED AND DISTILLED, STATISTICS AND HISTORY OF. Alcoholic liquors are naturally divided into three groups: (1) fermented liquors or wines, in which the sugar of fruit is converted to alcohol by simple exposure to the air; (2) malt liquors, such as beer, ale, porter, which, being mostly made from grains and starchy materials, require the preliminary process of malting, by which the starch is converted into sugar, before alcoholic fermentation is possible; (3) distilled liquors or ardent spirits, as brandy, whisky, gin, in which the fermented liquor, whether derived from fruits, grain, or other sugar-producing material, is treated to a further process of distillation, or vaporizing and condensing. That the industry is one of considerable importance is shown by the fact that during the year ending June 30, 1910, 1,784,553,510 gallons of malt liquors, 156,237,526 gallons of distilled liquors, and 50,000,000 gallons of wines were manufactured in the United States. This was produced by 2317 establishments, and the total product was valued at $592,550,348.

Wine Manufacture. Wine, being the product of natural forces and not requiring machinery for its production, is the oldest of the beverages and was made before the dawn of history. With the cultivation of the vine and the growth of complex tastes the industry became highly developed. The wines of Greece and Rome were prepared with greatest care and often flavored with spices and herbs. Throughout the Middle Ages and in modern times the manufacture of wine has been an important industry in most European countries. The settlers of America brought with them both a taste for wine and a knowledge of its manufacture. But early attempts to introduce this industry were unsuccessful because of failure to acclimate the European vines. The successful use of a native American grape—the Catawba—marked the beginning of this industry east of the Rockies. In California, however, foreign vines were introduced and successfully cultivated by Catholic missionaries from Mexico as early as 1771, but a century passed before wine manufacture became an important industry. Of the States east of the Rockies where wine is made, Ohio, New York, and Missouri are far in the lead. By the census of 1860 the total value of the product for the United States was $400,791, of which $155,966 was from New York and $47,275 from Ohio. By the census of 1910 the value of the product in New York was $1,816,620; Ohio, $1,303,697; Missouri, $336,809. The importance that the California industry had assumed during the 50 years between these two censuses is shown by the fact that of the total product in the United States in 1910, valued at $13,120,846, California produced an amount valued at $8,936,848. The wine product of the United States is still small as compared with that of the other wine-producing countries of the world, as is shown by the accompanying figures (the latest available), giving the estimated wine product of the world for 1912. See WINE.

ESTIMATED WINE CROP OF THE WORLD FOR THE YEAR 1912

	Gallons
France	1,306,451,762
Italy	995,702,400
Spain	312,400,000
Algeria	146,765,000
Argentine Republic	90,200,000
Russia	83,600,000
Portugal	79,750,000
Austria	55,000,000
Chile	55,000,000
Germany	52,800,000
United States	35,200,000
Bulgaria	26,400,000
Turkey and Cyprus	22,000,000
Switzerland	19,866,000
Rumania	19,800,000
Brazil	9,900,000
Servia	9,900,000
Tunis	5,500,000
Uruguay	4,620,000
Australia	4,400,000
Peru	4,400,000
Cape countries	3,300,000
Bolivia	1,760,000
Madeira	836,000
Mexico	440,000

CONSUMPTION OF SPIRITS IN THE PRINCIPAL COUNTRIES OF EUROPE

Compiled from Mulhall's Dictionary of Statistics and from New Dictionary of Statistics (Webb)

	Million gallons			Gallons per capita		
	1885	1895	1909	1885	1895	1909
United Kingdom	35	39	40.1	0.96	1.00	0.96
Germany	70	98	94.0	1.58	1.90	1.48
France	64	68	70.0	1.69	1.78	1.81
Austria	84	105	54.0	2.20	2.60	1.81
Russia	137	132	232.0	1.46	1.03	1.45
Scandinavia	17	17	...	2.10	1.90	...
Belgium	12	14	10.0	2.02	2.20	1.42
Holland	9	9	10.0	2.02	1.91	1.84
Italy, etc.	16	18	26.0	0.25	0.25	0.76
Europe	444	500	...	1.22	1.30	...

Manufacture of Malt Liquors. The early history of this industry in the United States is described as follows in the twelfth census: "In colonial times as well as in the early decades of the nation's history, the consumption of malt liquors was relatively small and increased slowly. The wide distribution of small quantities of wine manufactured from currants or grapes, the introduction of tea, the general consumption of all classes of distilled spirits, and the household

DISTILLED SPIRITS, WINES, AND MALT LIQUORS

QUANTITIES CONSUMED AND AVERAGE ANNUAL CONSUMPTION PER CAPITA IN THE UNITED STATES FROM 1890 TO 1913

YEAR ENDING JUNE 30	DISTILLED SPIRITS CONSUMED				WINES CONSUMED		
	Domestic *		Imported for consumption	Total	Domestic *	Imported for consumption	Total
	From fruit	All other					
	Proof gals.	*Proof gals.*	*Proof gals.*	*Proof gals.*	*Gallons*	*Gallons*	*Gallons*
1890	1,508,130	84,760,240	1,561,192	87,829,562	23,896,108	5,060,873	28,956,981
1891	1,219,436	88,335,483	1,602,646	91,157,565	23,736,232	5,297,560	29,033,792
1892	1,961,062	95,187,385	1,179,671	98,328,118	23,033,493	5,434,367	28,467,860
1893	1,687,541	98,202,790	1,397,422	101,287,753	26,391,235	5,596,584	31,987,819
1894	1,430,553	88,046,771	1,063,885	90,541,209	18,040,385	3,252,739	21,293,124
1895	1,102,703	75,228,998	1,496,860	77,828,561	16,589,657	3,054,392	19,644,049
1896	1,440,810	68,069,563	1,541,504	71,051,877	14,599,757	4,101,649	18,701,406
1897	1,146,131	69,789,991	2,230,711	73,166,833	33,940,319	4,647,988	38,588,307
1898	1,411,448	79,159,590	916,549	81,487,587	17,453,684	3,113,633	20,567,317
1899	1,306,218	84,614,652	1,389,358	87,310,228	22,835,587	3,525,109	26,360,696
1900	1,386,361	94,156,023	1,705,998	97,248,382	26,492,491	3,935,000	30,427,491
1901	1,509,271	100,004,878	1,941,189	103,455,338	24,008,380	4,388,140	28,396,520
1902	1,403,204	104,140,707	2,182,230	107,726,141	44,743,815	5,020,105	49,763,920
1903	1,515,072	113,715,776	2,439,106	117,669,954	32,634,293	5,604,525	38,238,818
1904	1,637,331	116,794,496	2,655,560	121,087,387	37,538,799	5,772,418	43,311,217
1905	1,595,021	116,544,802	2,729,826	120,869,649	29,369,408	5,690,309	35,059,717
1906	1,781,643	122,961,612	3,108,328	127,851,583	39,847,044	6,638,179	46,485,223
1907	1,993,688	134,308,693	3,782,055	140,084,436	50,079,283	7,659,565	57,738,848
1908	1,670,031	119,951,185	3,758,098	125,379,314	44,421,269	7,700,377	52,121,646
1909	1,850,700	114,913,702	4,365,634	121,130,031	53,609,995	8,169,554	61,779,549
1910	2,204,184	126,593,951	4,340,549	133,138,684	50,684,343	9,863,735	60,548,078
1911	2,434,045	132,315,123	3,836,821	138,585,989	56,655,006	7,204,226	63,859,232
1912	2,449,331	133,502,079	3,544,921	139,496,331	50,619,880	5,804,831	56,424,711
1913	2,801,767	140,521,880	4,121,981	147,745,668	48,683,849	6,643,612	55,327,461

* Since 1866 includes domestic spirits exported and returned.

This table does not include withdrawals of distilled spirits free of tax for scientific purposes and for the use of the United States government or since 1906 withdrawals for denaturation free of tax.

Totals do not include data with respect to commerce between the United States and insular possessions from 1901 to date.

NOTES. — (1) The production of domestic wines from 1871 to 1892 was estimated by the Department of Agriculture, by Mr. Charles McK. Leoser, president of the Wine and Spirit Traders' Society of New York, and other well-informed persons, and the production for 1889 (opposite the year 1890) is that officially reported by the United States Census. (2) The consumption of domestic spirituous and malt liquors was obtained from reports of the Commissioner of Internal Revenue.

DISTILLED SPIRITS, WINES, AND MALT LIQUORS

QUANTITIES CONSUMED AND AVERAGE ANNUAL CONSUMPTION PER CAPITA IN THE UNITED STATES FROM 1890 TO 1913

YEAR ENDING JUNE 30	MALT LIQUORS CONSUMED			Total consumption of wines and liquors	TOTAL CONSUMPTION PER CAPITA			
	Domestic *	Imported for consumption	Total		Of distilled spirits	Of wines	Of malt liquors	Of all liquors and wines
	Gallons	*Gallons*	*Gallons*	*Gallons*	*P. gals.*	*Gals.*	*Gals.*	*Gals.*
1890	853,075,734	2,716,601	855,792,335	972,578,878	1.40	.46	13.67	15.53
1891	974,427,863	3,051,898	977,479,761	1,097,671,118	1.43	.45	15.31	17.19
1892	984,515,414	2,980,809	987,496,223	1,114,292,201	1.51	.44	15.17	17.12
1893	1,071,183,827	3,362,509	1,074,546,336	1,207,821,908	1.52	.48	16.20	18.20
1894	1,033,378,273	2,940,949	1,036,319,222	1,148,153,555	1.34	.31	15.32	16.97
1895	1,040,259,039	3,033,067	1,043,292,106	1,140,764,716	1.13	.28	15.13	16.54
1896	1,077,325,634	3,300,531	1,080,626,165	1,170,379,448	1.01	.26	15.38	16.65
1897	1,066,307,704	3,002,558	1,069,310,262	1,181,065,402	1.02	.53	14.94	16.49
1898	1,161,769,114	2,457,348	1,164,226,462	1,266,281,366	1.12	.28	15.96	17.36
1899	1,132,723,202	2,797,427	1,135,520,629	1,249,191,553	1.17	.35	15.28	16.80
1900	1,218,183,252	3,316,908	1,221,500,160	1,349,176,033	1.27	.40	16.01	17.68
1901	1,255,464,062	3,596,382	1,259,060,444	1,390,912,302	1.31	.36	15.98	17.65
1902	1,378,661,954	3,707,222	1,382,369,176	1,539,859,237	1.34	.61	17.18	19.14
1903	1,446,103,812	4,204,538	1,450,308,350	1,606,217,122	1.43	.47	17.67	19.57
1904	1,494,541,140	4,837,075	1,499,378,215	1,663,776,829	1.45	.52	17.91	19.87
1905	1,533,325,442	5,201,168	1,538,526,610	1,694,455,976	1.42	.41	18.02	19.85
1906	1,694,458,014	5,963,207	1,700,421,221	1,874,758,027	1.47	.53	19.54	21.55
1907	1,815,141,683	7,171,842	1,822,313,525	2,020,136,809	1.58	.65	20.56	22.79
1908	1,821,418,322	7,314,126	1,828,732,448	2,006,233,408	1.39	.58	20.56	22.22
1909	1,745,523,769	7,110,657	1,752,634,426	1,935,544,011	1.32	.67	19.07	21.06
1910	1,844,065,029	7,301,629	1,851,666,658	2,045,353,420	1.42	.65	20.09	22.19
1911	1,959,671,296	7,240,548	1,966,911,854	2,169,356,975	1.46	.67	20.66	22.79
1912	1,925,361,507	7,169,677	1,932,531,184	2,128,452,226	1.44	.58	19.96	21.98
1913	2,022,678,149	7,669,223	2,030,347,372	2,233,420,461	1.50	.56	20.62	22.68

* Product less domestic exports.

FERMENTED LIQUORS AND DISTILLED SPIRITS PRODUCED

AND THE QUANTITY OF DISTILLED SPIRITS TAX PAID FOR CONSUMPTION, FROM 1890 TO 1914

(From Reports of the United States Commissioner of Internal Revenue)

YEAR ENDING JUNE 30	Production of fermented liquors	Production of distilled spirits, exclusive of brandy, distilled from fruit *				
		Bourbon whisky	Rye whisky	Alcohol	Rum	Gin
	Barrels †	*Tax. gals.*	*Tax. gals.*	*Tax. gals.*	*Tax. gals.*	*Tax. gals.*
1890	27,561,944	32,474,784	13,355,577	11,354.448	1,657,808	1,202.940
1891	30,487,209	29,931,415	14,345,389	12,260,821	1,784,312	1,293,874
1892	31,856,626	29,017,797	13,436,827	14,490,987	1,956,318	1,338,617
1893	34,591,179	40,835,873	16,702,240	12,250,380	2,106,765	1,424,490
1894	33,362,373	15.518,349	10,026,544	10,570,070	1,864,595	1,287,977
1895	35,589,784	18,717,153	12,321,543	8,819,923	1,777,083	1,176,669
1896	35,859,250	16,935,862	9,153,066	9,960,301	1,490,228	1,098,376
1897	34,462,822	6.113,726	4,269,220	9,503,353	1,294,157	1,159,314
1898	37,529,339	13,439,459	8,818,240	11,672,795	1,340,547	1,267,579
1899	‡ 36,697,634	17,256,331	10,792,565	11,974,354	1,494,379	1,266,823
1900	‡ 39,471,593	19,411,829	14,296,568	10,735,771	1,614,514	1,597,081
1901	‡ 40,614,258	26,209,803	18,263,709	10,775,116	1,724,582	1,636,299
1902	‡ 44,550,127	20,336,250	21,587,221	11,483,304	2 202,047	1,752,280
1903	‡ 46,720,179	26,068,554	22,407,053	12,034,126	2,247,906	1,913,404
1904	‡ 48,265,168	20,247,089	18,371,344	11,486,082	1,801,179	2,110,215
1905	‡ 49,522,029	26,742,168	20,410,422	11,610,799	1,791,987	2,187,709
1906	‡ 54,724,553	24,968,943	21,469,720.5	11,173,614	1,730,102	2,323,289
1907	‡ 58,622,002	33,090,791	23,550,195	16,123,379	2,022,407	2,947,688
1908	‡ 58,814,033	14,120,484	13,587,868	16,849,154	1,895,922	2,756,753
1909	‡ 56,364,360	§ 70,152,174.6		‖ 16,078,083	1,952,374	2,483,743
1910	‡ 59,544,775	§ 82,463,894.0		‖ 17,623,867	2,253,950	2,985,435
1911	‡ 63,283,123	§ 100,647,155.5		‖ 24,408,462	2,631,059	3,345,371
1912	‡ 62,176,694	§ 98,209,574.4		‖ 27,629,346	2,832,516	3,577,862
1913	‡ 65,324,876	§ 99,615,828.1		‖ 30,320,894	2,750,846	4,014,601
1914	‡ 66,184,473	§ 88,698,797.3		‖ 30,715,200	3,026,085	4,012,543

YEAR ENDING JUNE 30	Production of distilled spirits, exclusive of brandy distilled from fruit *				Production of fruit brandy, including apple, peach, and grape	Total production of distilled spirits	Distilled spirits other than fruit brandy (tax paid for consumption)
	High wines	Pure neutral, or cologne spirits	Miscellaneous	Total			
	Tax. gals.	*Tax. gals.*	*Tax. gals.*	*Tax. gals.*	*Tax. gals.*	*Tax. gals.*	*Tax. gals.*
1890	555,572	34,022,619	14,652,180	109,275,928	1,825,810	111,101,738	83,535,260
1891	1,007,070	35,356,126	19,983,382	115,962,389	1,804,712	117,767,101	87,254,001
1892	633,590	37,690,335	16,204,570	114,769,041	3,667,465	118,436,506	93,084,725
1893	449,209	37,577,052	17,305,773	128,651,782	2,358,548	131,010,330	97,458,348
1894	126,506	35,377,115	14,434,336	89,205,492	2,948,159	92,153,651	87,346,834
1895	209,699	21,062,216	15 865.309	79,949,595	1,960,176	81,909,771	74,453,039
1896	198,299	25,564.738	22,181,833	86,588,703	3,403,852	89,992,555	67,039.910
1897	206,739	16,877,306	23,041,833	62,465,648	1,813,427	64,279,075	68,833,231
1898	174,124	20,613,205	23,436,264	80,762,213	2,906,198	83,668,411	78,353,301
1899	420,833	25,876,229	27,983,051	97,064,565	3,097,769	100,162,334	83,819,314
1900	249,743	24,173,671	33,405,523	105,484,700	3,760,487	109.245,187	93,500,840
1901	454,626	30,228,803	35,227,657	124,520,600	4,047,602	128,568,201	99,191,721
1902	341,222	37,429,734	33,491,341	128,623,401	4,220,400	132,843,802	103,304,981
1903	286,432	54,620,399	22,198,323	141,776,202	6,430,673	148,206,875	112,788,168
1904	309,990	57,997,506	21,988,544	134,311,952	5,193,262	139,505,214	116,033,305
1905	192,066	60,944,810	23,930,830	147,810,794	5,448,584	153,259,378	115,994,857
1906	179,313	59,626,733	24,194,411	145,666,125	4,444,072	150,110,197	122,617,943
1907	124,935	60,802,852	29,911,664	168,573,913	6,138,305	174,712,218	134,031,067
1908	50,062	50,935,821	26,793,676	127,140,925	6,899,823	134,040,748	119,703,594
1909	221,277	¶ 42,563,104	**	133,450,755	6,440,858	139,891,613	114,693.578
1910	206,534	¶ 50,703,846	....	156,237,526	7,656,434	163,893,960	126,384,727
1911	165,018	¶ 44,205,330	....	175,402,395	7,953,132	183,355,527	132,058,636
1912	131,002	¶ 45,869,685	....	178,249,985	9,321,823	187,571,808	133,259,148
1913	90,294	¶ 48,560,920	....	185,353,383	8,252,875	193,606,258	140,289,425
1914	26,485	¶ 47,132,536	....	174,614,645	7,307,897	181,919,542	136,269,753

* No returns of the production of the different kinds of spirits other than fruit brandy were made prior to July 1, 1877.
† Of not more than 31 gallons. ‡ Includes fermented liquors removed from breweries for export free of tax.
§ Whisky
‖ Commercial alcohol
¶ Alcohol
** No classification
New classification made to harmonise with pure-food law.

manufacture of cider and fruit brandies, satisfied the tastes of the people, and the demand for malt liquors was of slow development. Where the demand existed at all it was for ale, porter, or stout. The manufacture of lager beer in the United States was begun about 1840. It extended with the general increase of population, the influx of German immigrants, and the cultivation of the tastes of the people for milder beverages. In 1900 its use had almost entirely superseded that of ale and porter." Since 1850 the manufacture of malt liquors in the United States has steadily and rapidly increased, the number of factories rising from 431 to 1414; the amount of capital invested from $4,072,380 to $671,158,110; and the value of product from $5,728,568 to $374,730,096. An army of nearly 66,725 wage earners are now employed in producing this enormous annual output. Owing to the nature of the raw material required, the industry is more widely spread throughout the country than that of wine manufacture. Since in this industry the transportation of the finished product is more expensive than that of the raw material, the centres of manufacture are near the place of consumption, i.e., in or near the large cities. In this respect the industry differs from the manufacture of either wine or distilled spirits, in both of which the cost of transporting the raw material is much greater than that of the finished product. In value of malt liquors produced, the States rank as follows: New York, Pennsylvania, Wisconsin, Illinois, Missouri, Ohio, New Jersey. See BEER; BREWING.

Manufacture of Distilled Liquors. The history of this industry in the United States is not characterized by the steady growth which marks the other two branches of alcoholic industries. The number of distilleries reported by the census in 1850 was 968, and, in 1910, 613. The amount of capital engaged in the industry, however, was only $5,409,334 in 1850 as against $72,450,336 in 1910, and the value of the output was $15,770,240 as against $204,699,412 in 1910. The number of employees in 1850 was about 4000, while in 1910 it was 8328. The distilleries were scattered among 27 States, among which Illinois ranked first in amount of product, Kentucky second, and Indiana, Pennsylvania, Ohio, Louisiana, Maryland, and California followed, in the order named. A large amount of distilled liquor is consumed each year in the arts and sciences and also in the manufacture of medicines. On the other hand, a large amount is produced every year in illicit distilleries, of which, of course, no record is possible. Taking these and other considerations into account, it was estimated that the quantity consumed as a beverage by the people of the United States during 1910 was about 133,500,000 gallons, or a per capita consumption of approximately 1.45 gallons.

See ALCOHOL; DISTILLED LIQUORS; RUM; WHISKY; ETC.

LIQUOR TRAFFIC. The social evils, in the shape of poverty, vice, crime, and loss of social efficiency, resulting from the widespread use of intoxicating liquor as a beverage have incited efforts in all civilized countries to restrict the practice. While the evils in question are generally recognized, there is a wide divergence of opinion as to the wise and proper method of dealing with the problem. At one extreme is a large but diminishing class of intelligent people who believe that the remedy lies only in the general diffusion of intelligence and in the elevation by moral means of the habits of the community. At the other extreme is now a larger and increasing number of people who regard the absolute prohibition and sale of intoxicating beverages as the only efficacious remedy. Between these two extremes lies the great body of intelligent public opinion, which deems it necessary that the liquor traffic shall be restricted, but doubts the efficacy or the wisdom of absolute prohibition. The temperance movement in Europe, as well as in America, has accordingly become in large measure a movement for some form of governmental interference with the sale of intoxicants.

This interference—sometimes open and avowed, sometimes disguised as a revenue measure—has taken on various experimental forms, all of which have been attended with an encouraging measure of success, but none of which, owing to the unsettled state of public opinion on the question and to the frequent changes of policy resulting therefrom, have proved wholly successful in attaining the desired end. The measures thus resorted to in the United States have been the following:

1. The segregation of the liquor traffic, confining it by statute or by municipal regulation to certain areas or excluding it from certain residential districts in cities. This method has been employed on a considerable scale in a number of Western cities, and indeed, to a limited extent, in most cities and many villages and the District of Columbia by regulations prohibiting saloons within a fixed distance from schools, churches, etc.

2. Restriction of the number of saloons or other places where liquors are sold to a fixed ratio to the population. This plan has been adopted in Massachusetts, which limits the number to one for every thousand inhabitants in the State at large, and one to every 500 in the city of Boston.

3. High license, or the imposition of a license fee or tax high enough to effect automatically a restriction on the number of saloons and to shut out the poorer and more disreputable drinking places, especially such as are the haunts of criminals and prostitutes. This plan has been widely adopted as a temporary, if not a permanent, method of dealing with the problem, generally in connection with the methods of segregation, restriction, or local option, and is employed to-day in practically all the States which have not adopted the policy of absolute prohibition. The license fee varies greatly in amount, the maximum being usually $1000 per annum (as in Alaska, Massachusetts, Ohio, and many other States) to $1500 (in the District of Columbia, New York, Rhode Island, and New Mexico) and $2000 (in Utah).

4. Local option, or the plan of vesting in counties, cities, or towns the power to determine by popular vote whether they shall be "wet" or "dry," i.e., whether the sale of intoxicating liquors shall be permitted or not. This method is now in force, along with high license, in practically all the States which have not absolutely prohibited the traffic.

Inasmuch as these methods of regulation, while often locally advantageous, have not resulted in materially diminishing the social evils at which they are aimed, the sentiment in favor of the absolute prohibition of the liquor traffic has grown enormously during recent years and now bids fair to become the dominant influence in determining the policy of the State with reference to the evil. The State of Maine was the first American Commonwealth to adopt this measure, the "Maine Law," as it has come to be known, having been enacted as early as 1846 and being still in force. Similar legislation in Vermont (1852), New Hampshire (1855), Connecticut (1854), and New York (1855), was later repealed, local-option laws having in each case superseded the prohibition law. After a generation of experimentation with the regulative measures above described, the movement for "State-wide prohibition" has revived with new force. Up to June, 1915, 14 States had adopted the policy. A movement for national prohibition resulted in the introduction in Congress of the Hobson-Shepard joint resolution to submit a constitutional amendment to the States. The vote in the House gave a majority in favor, but not the necessary two-thirds (Dec.

22, 1914). The resolution was reintroduced the next month. See Intoxicating Liquors; License; Prohibition; Temperance Movement.

LIRA, lē′rȧ (It., from Lat. *libra*, pound). An Italian silver coin, of greater or less value according to time and place. The Tuscan lira was equal to 80 French centimes; the Austrian lira, or zwanziger, was of about the same value. The present lira of Italy, a silver coin, is equal to the French franc (about $0.193), and is divided into 100 centesimi.

LIRI, lē′rē. See Garigliano.

LIRIA, lē′rē-ȧ. A town of Spain, in the Province of Valencia, and 12 miles northwest of Valencia (Map: Spain, E 3). The plain in which it stands is planted with vines and olives and also produces fruits and cereals. Near by are vestiges of the ancient Edeta. Entirely aside from this identification, the history of Liria has been long and interesting. It was taken from the Saracens by James of Aragón (1252), was captured by Peter of Castile in 1363, and belonged to the crown and had a vote in the Cortes until it was given by Philip V to Marshal the Duke of Berwick, with the title of Duke of Liria. It suffered severely in the Carlist Wars. (See Liria, Dukes of.) There are mineral springs in the neighborhood. Pop., 1900, 8839; 1910, 9034.

LIRIA, Dukes of. By royal patent of 1707 Philip V conferred upon James Fitz-James, first Duke of Berwick, who had rendered him important services as field marshal in the War of the Spanish Succession, the title of Duke of Liria and Xérica, with a grandeeship of Spain. This title descended through the male line (each generation rendering distinguished services to Spain) until Carlos Miguel Stuart Fitz-James, as seventh Duke of Berwick and seventh Duke of Liria and Xérica, inherited from his aunt (1802) the headship of the ancient house of Alba as fourteenth Duke of Alba de Tormes. Since then these two great houses have been united, and the heir to the Duke of Berwick and Duque de Alba (as the head of the house is known) assumes by courtesy the title of Duque de Liria.

LIR′IODEN′DRON. A genus of plants. See Tulip Tree.

LI′RIS. See Garigliano.

LISA, lē′sȧ, **LIZA**, lē′sȧ, **LIZITA**, lē-sē′tȧ. Names in the Spanish West Indies for various mullets. See Mullet.

LISAINE, lē′zȧn′, Battle of. An engagement in the Franco-Prussian War, which raged for three days (Jan. 15–17, 1871) on the small river Lisaine, near the French fortress of Belfort (q.v.). Gambetta, hoping to withdraw the Germans from around Paris by a diversion in southern Germany, ordered Bourbaki to threaten the enemy around Belfort and to attempt an inroad into Baden. The German general, Von Werder, retreated before Bourbaki and took up a position along the Lisaine, in order to defeat this plan. Bourbaki, with 120,000 men, made desperate efforts to drive the Germans from their position, but the latter were so strongly fortified, and the French soldiers were so weak from labored marches and lack of food, that these efforts were without avail. Surrounded on three sides by the victorious Germans, the remnants of the French army, 85,000 in number, crossed the border line into Switzerland, where they were interned until the close of the war. Consult Belin, *Le siège de Belfort* (Paris, 1871).

LISBOA, lēs-bō′ȧ, João Francisco (1812–63). A South American author, born at Iguará, Maranhão, Brazil. He studied at one of the colleges at Rio de Janeiro and became a journalist. He edited various newspapers, including the *Cronica* (1838–41), and the *Jornal de Timon* (1852–58), which he wrote as well as edited himself. It contained historical and political papers criticizing both sides, although he was of the Liberal party. He was clerk to the Secretary of the government from 1835 until 1838, and took an active part in politics. Afterward he devoted himself to historical research and went to Lisbon, Portugal, where he died. His distinguished services had been rewarded with the cross of Commander in the Order of Christ, of Brazil. His works include: *Vida do Padre Antonio Vieira* (1874); *Historia do Maranhão* (1850); *Obras completas, antecedidas de uma noticia biographica pelo dr. Antonio Henriques Leal* (4 vols., 1864–65); and several in manuscript. The aforesaid biographical notice may also be found in A. H. Leal, *Pantheon maranhense*, vol. iv (Lisbon, 1874).

LISBON, lĭz′bŭn (Portug. *Lisboa*). The capital of Portugal and of the Province of Estremadura, situated on the north shore of the estuary of the Tagus, 7 miles from the ocean; lat. 38° 43′ N., long. 9° 11′ W. (Map: Portugal, A 3). The estuary is here about 1½ miles wide, but immediately above the city it widens into a tidal lake from 4 to 8 miles wide and about 11 miles long, forming one of the best harbors of Europe, with deep water both in the lake and through the narrow entrance, which is defended by fortifications. The city stretches along the shore of channel and lake for 5 miles; it extends inland for over 3 miles, and rises in a succession of terraces, its houses mingling with the green foliage of its parks. The surrounding district is dotted with villas. The city proper consists of four municipal districts (*bairros*): the old town, the *Alfama*, in the east; the new town, or the *Cidade Baixa*, in the middle and on the low ground next to the Tagus; the *Bairro Alto* on the heights to the north; and *Alcántara* in the west. It is not fortified on the land side, and straggles off in long avenues bordered with villas towards the plateau of Estremadura.

The old town is built around a hill surmounted by the Castello de São Jorge, an old Moorish castle now used as barracks and military prison. This was the only part of the city not destroyed by the great earthquake of 1755. It still has a number of Moorish and Roman remains, and its streets are narrow and crooked, besides being steep and ill-paved. There are a large number of churches in this section, many of them very old, especially the Sé Patriarchal, or cathedral, founded in 1150. It was destroyed by an earthquake in 1344, rebuilt in 1380, and damaged by the earthquake of 1755; later it suffered from fire. After restoration the only parts wholly of the fourteenth century were choir and façade. The new town, which is west of the Alfama and was built up subsequent to the great earthquake, is regularly laid out with wide streets crossing at right angles, and traversed by numerous street railways. Facing the river front is the largest square in the city, the Praça do Commercio, surrounded by public buildings and containing a large statue of King Joseph I in the centre. On the west side of the square are the general post office and the naval arsenal; on the east are the exchange and the customhouse; and on the north are two ministerial buildings and the city hall. From this plaza extend eight parallel streets to the north, the one in the centre being entered through a triumphal arch, and all of them terminating at the Praça de Dom Pedro Quarto, with a statue of that monarch and two bronze fountains. Running northwest from the praça is the largest and finest promenade in the city, the Avenida da Liberdade, which is 1 mile long and 300 feet wide, with a double row of shade trees along the middle. It passes near the Botanical Garden, one of the finest in Europe, containing a superb collection of tropical plants, and inclosing also the polytechnic school and the astronomical observatory. Half a mile to the west is the beautiful Estrella Garden, opposite the Estrella Church, the most conspicuous building in the city, with a white marble cupola and two bell towers that can be seen for many miles around. Still farther to the west, and within the limits of the bairro of Alcántara, stands the palace, an eighteenth-century edifice, with a fine park, the Tapada das Necessidades; and from here the road crosses the Alcántara River into the suburbs of Belem and Ajuda, forming the extreme western part of the city.

Lisbon has a medical school (1836), a polytechnic school (1837), a normal school, several high schools, schools of commerce, agriculture, and navigation, academies of art and music, several museums, scientific academies and societies, and the national public library, containing over 400,000 volumes, 15,000 manuscripts, and 40,000 coins and medals. Among public works should be mentioned the two aqueducts, one 15, the other 70 miles long, which supply the city with abundant and pure water. The sewerage system is excellent, and the city is one of the cleanest in Europe. It has manufactures of jewelry, musical instruments, woolen, cotton, and silk fabrics, gloves, hats, shoes, paper, soap, and chemicals, and various other articles; it has also sugar refineries, iron foundries, and machine shops. Commercially Lisbon has the natural advantages of harbor and geographical position that should make it a leading centre of traffic. Its trade is principally with England, Brazil, and the African colonies. The chief imports include grain, sugar, cotton, tobacco, coal, petroleum, and timber; the chief exports, cork, wine, olive oil, salt, fruits, and fish; besides, Lisbon is an important port of transit for colonial wares. The largest vessels can enter the Tagus; on the right bank are extensive quays and two graving docks, on the left bank government and private docks. The city has five railway stations. There is a railway bridge across the Tagus. The city is lighted by electricity and gas. In 1901 cable cars and mule trams were superseded by a system of electric street railways. The aggregate de facto population of the four bairros comprising Lisbon was 301,206 in 1890, 356,009 in 1900, and 435,359 in 1911 (census of December 1). The inhabitants of 10 years of age and over in 1911 numbered 361,941, and of these 153,745 could neither read nor write.

Lisbon was called *Olisipo* by the ancient Lusitanians; the Visigoths changed the name to *Olisipona*, and the Moors to *Lishbuna*, whence the present name. It is said to have been founded by the Phœnicians, and was the flourishing capital of Lusitania when first visited by the Romans. It was taken by the Moors in 716 and held by them till 1147, when it was recaptured by Alfonso I with an army of Crusaders, mostly Englishmen. During the centuries of Portuguese exploration Lisbon rose to a high position of commercial supremacy. It lost this position during the Spanish occupation (1580–1640). On the 1st of November, 1755, the city was visited by a frightful earthquake, which laid the greater part of it in ruins and killed 30,000 to 40,000 persons. Its rapid recovery was due largely to the energy of the Prime Minister, the Marquis of Pombal. In 1807–08 the city was occupied by the French.

LISBON. A town in Androscoggin Co., Me., 7 miles south of Lewiston, on the Maine Central Railroad (Map: Maine, B 4). The chief industries are represented by cotton, wool, and paper mills. Farming, too, is engaged in extensively. Pop., 1900, 3603; 1910, 4116.

LISBON. A village and the county seat of Columbiana Co., Ohio, 24 miles (direct) south of Youngstown, on the Beaver River and on the Erie, the Youngstown, and Ohio River, and the Pittsburgh, Lisbon, and Western railroads (Map: Ohio, J 4). It has a public library and is the centre of a productive region engaged in farming, coal mining, and sheep raising. There are copper mills and manufactories of sewer pipe, pottery, etc. Pop., 1900, 3330; 1910, 3084. Lisbon was the birthplace of Mark A. Hanna.

LISBURN, lĭz′bûrn. A market town and cathedral city on the Lagan, in the County of Antrim, Ireland, 8 miles south-southwest of Belfast (Map: Ireland, F 2). It is clean and well ordered, with a convenient market and considerable manufactures of fine linens and damasks; there are also large rope works, net factories, and dye works. Its parish church is the cathedral of the Protestant diocese of Down, Connor, and Dromore. There is a fine park, known as Castle Garden, which was presented to the town by Sir Richard Wallace in 1888. A noteworthy feature of the town is the monument to Jeremy Taylor, who was Bishop of that see and died at Lisburn in 1667. Lisburn originated in the erection of a castle, in 1610, by Sir Fulk Conway, to whom the manor was assigned in the settlement of James I; but its importance dates from the settlement of a number of Huguenot families who, after the revocation of the Edict of Nantes, introduced the manufacture of linen and damask, after the machine-fabricating methods employed in the Low Countries. Lisburn gives the title of Earl and Viscount to the Vaughan family. Pop., 1901, 11,460; 1911, 12,388.

LISCO, lĭs′kō, EMIL GUSTAV (1819–87). A German theologian. He was born in Berlin and was educated there and at Bonn. From 1845 to 1887 he was pastor of different churches in Berlin and became one of the most distinguished of its liberal preachers and theologians. He took a prominent part in the liberal Church movement and was one of the founders of the Berlin Union and the Union of the German Protestants. In 1872 he was severely reprimanded by the Consistory for his publication of *Legendenhafte Bestandteile in dem apostolischen Glaubensbekenntnis* (1872). He also published *Berlin und der Protestantismus* (1870–73) and *Der Glaube an den Heiligen Geist* (1860).

LISCOW, lĭs′kō, CHRISTIAN LUDWIG (1701–60). A German satirist, born at Wittenburg, Mecklenburg-Schwerin. He studied law at the universities of Rostock, Jena, and Halle. In 1741 he entered the Saxon civil service, where he attained the rank of counselor in 1745. Liscow is considered one of the best German prose writers before Lessing. He attracted much attention by his essay *Die Vortrefflichkeit und Notwendigkeit der elenden Skribenten* (1736). He republished his different satirical writings collectively, under the title *Sammlung satirischer und ernsthafter Schriften*, in 1739. Consult B. Litzmann, *C. L. Liscow in seiner literarischen Laufbahn* (Hamburg, 1883).

LISGAR, lĭz′gar, first Baron. See Young, Sir John.

LISIEUX, lē′zyẽ′ (Lat. *Noviomagus*). A town in the Department of Calvados, France, situated in the valley of the Touques, 118 miles west of Paris (Map: France, N., F 3). The church of St. Pierre of the twelfth and thirteenth centuries is said to be the oldest Gothic church in Normandy. It was built by the Bishop of Beauvais, one of the judges at the trial of Joan of Arc, to atone for his condemnation of the maid. The church of St. Jacques (1496–1501) contains fine mural paintings, stained glass, and wood carving. The episcopal palace, built during the seventeenth and eighteenth centuries, and now used as a courthouse, contains a fine hall and a small collection of modern French paintings. Lisieux has numerous private houses in Mediæval and Renaissance styles and remains of an old Roman building. The chief educational institutions are the communal college, a seminary, and a library of 24,000 volumes. Textiles, leather, lumber, metal wares, and machinery are the chief manufactures, and the trade is in agricultural and dairy products and cattle. Prior to the conquest of the Gauls Lisieux was known as Noviomagus, the capital of the Lexovii. It was the seat of a bishop from the sixth century to 1790. Pop., 1901, 16,084; 1911, 15,948.

LISLE, lĭl, Alice (c.1614–85). An Englishwoman, wife of the regicide John Lisle. On the charge of harboring John Hickes, a traitor, whom she knew only as a Nonconformist minister, she was tried before Judge Jeffreys, who forced the jury to convict her. She was condemned to be burned, but this sentence was commuted, and she was beheaded Sept. 2, 1685. On the scaffold she gave the sheriff a paper denying her guilt, and it was published in *The Dying Speeches of . . . Several Persons* (1689). By an act of Parliament passed at the beginning of the reign of William and Mary her attainder was reversed on the ground that the verdict against her had been extorted by violence. Consult Howell, *State Trials*, and H. B. Irving, *The Life of Judge Jeffreys* (New York, 1898).

LISLE, lēl, Charles Marie Leconte de. See Leconte de Lisle, C. M.

L'ISLE, Claude Joseph Rouget de. See Rouget de l'Isle, C. J.

LISLE, Guillaume de (1675–1726). A French geographer, born in Paris. He devoted himself to the study of cartography from an early age and produced a large number of maps marked by a correctness of treatment far above the general geographical knowledge of the time. Besides purely geographical works he published a large number of maps in connection with editions of voyages of discovery and exploration. In 1702 he was elected to the Académie des Sciences and in 1718 was made Royal Geographer.

L'ISLE ADAM, Philippe Auguste Mathias, Comte de Villiers de. See Villiers de l'Isle Adam, P. A. M.

LISMORE, lĭz-mōr′. An island of Argyllshire, one of the Inner Hebrides, 6 miles from Oban (Map: Scotland, C 3). It is noted for its antiquities: the parish church, formerly the choir of a cathedral; the remains of the Achinduin Castle, the ancient residence of the bishops of Argyll; and the ruins of Castle Rachal, a Scandinavian fort. It is chiefly noted for the "Book of Lismore," a collection of early Gaelic poems, made by James M'Gregor, dean of Lismore, early in the sixteenth century. Pop., 1901, 500; 1911, 407.

LISMORE. A town and episcopal see in County Waterford, Ireland, 43 miles west-southwest of Waterford (Map: Ireland, D 7). Lismore, one of the best-kept towns in Ireland, is situated on a bluff rising abruptly from the river Blackwater, which is spanned by a stone bridge erected in 1775. On the brink of this bluff and facing the river is Lismore Castle, erected by King John in 1185 but extensively restored in 1793 by the dukes of Devonshire, to whom it belongs. The Protestant cathedral of St. Carthagh contains many interesting sepulchral slabs of the ninth century. It was restored in 1633 and the present limestone spire was erected in 1827. The town, which is the centre of the salmon fisheries of the Blackwater, is famous as the birthplace of Robert Boyle the philosopher and Congreve the dramatic poet. It grew up around the abbey founded by St. Carthagh in the seventh century, which was so famous as to be styled the "luminary of the western world." It was besieged in 1641, when it suffered severely, and again in 1643 and 1645. Pop., 1911, 1583.

LISOLA, lē′zō′lȧ′, François Paul, Baron (1613–75). An Austrian diplomat, born at Salins in Franche-Comté. He began his diplomatic career in 1638. In 1643 he went to London as Ambassador to persuade Charles I to reinstate the Count Palatine. In 1655 he was sent to Sweden to effect peace with the Poles, but having failed to attain this, he induced the Emperor Ferdinand III to conclude an alliance with them. When Ambassador in Poland he brought about the reconciliation of that country with the Elector Frederick William of Brandenburg and at the same time established a union between this Prince and the Emperor. From Poland he was transferred to The Hague. In 1660 Lisola took part in the peace negotiations at Oliva, and after 1667 his great effort was to form a coalition against Louis XIV, whose plans he described and denounced in his famous pamphlet, *Le bouclier d'état et de justice contre le dessein de la monarchie universelle* (1667). It was also chiefly due to his exertions that an alliance was established between Austria and Holland in 1672, in which union Spain also joined the following year. A more detailed account of the life and work of Lisola is to be found in Reynald, "Le Baron de Lisola; sa jeunesse et sa première ambassade en Angleterre," in the *Revue Historique* (vol. xxvii, Paris, 1885), and Pribram, *Franz Paul Freiherr von Lisola und die Politik seiner Zeit* (Vienna, 1894).

LIS PEN′DENS (Lat., suit pending). In law the pendency of an action or other legal proceeding, comprehending the entire period of a litigation from the institution of the suit by the original process (summons, bill, or libel) to the execution of the final judgment. A person designated by a court to act for and represent an infant or lunatic during the pendency of a suit is known as a guardian *pendente lite*. Specifically, the phrase *lis pendens* has in English and American legal procedure come to be employed to denote the suspension of the right of the owner of specific property or of a claim to alienate or encumber the same during the pendency of an action in which the title thereto is being determined. The doctrine is a very old one in the English law and was early expressed in the maxim *pendente lite nihil innovetur* (pending the action nothing may be changed). It was adopted to prevent the intervention of new rights to property in dispute which might complicate and prolong the litigation. As was said by an eminent English judge: "The law does not allow litigant parties to give to others, pending the litigation, rights to the property in dispute, so as to prejudice the opposite party." If this were not so, there would be no certainty that the litigation would ever come to an end, as a mortgage or sale made before final decree to a person who had no notice of the pending proceedings would otherwise confer on him a right of property which would render a new suit necessary or might even defeat the purpose of the pending suit. The doctrine embodied in the foregoing statement is commonly put in the mistaken form that a *lis pendens* is notice to everybody dealing with the property in suit of the controversy respecting the title. In order to avoid the inconveniences and hardships of this doctrine it is now everywhere provided by statute that, in a suit affecting the title to real estate, a litigating party, in order to protect his rights, must file in the public record office a written notice of the pendency of the action, which notice (also known as a *lis pendens*) must specify the title and nature of the action and the date when it was commenced, and set forth a description of the property sought to be protected against sale or encumbrance. The registration of such notice holds good for a definite period of time specified in the statute. It has been held that a *lis pendens* so filed and registered is only notice of matters charged in the statement of claim and not also of every equity which might possibly arise out of the matters in question in the action. The most frequent use of the *lis pendens* in this sense of the term is by mortgagees when instituting suits for the foreclosure of mortgages on real estate. See SUIT; FORECLOSURE.

LIS'SA (anciently Lat. *Issa*, Slav. *Vis*). An island in the Adriatic Sea, off the Dalmatian coast, belonging to Dalmatia (Map: Italy, F 3). It is 10½ by 4½ miles and has an area of 38 square miles. Its shores are steep and rocky and it is accessible at only a few bays. The soil is not fertile. The chief products are wine and oil. The sardine fisheries are important. The population of the island in 1900 was 9918. Its two harbors are strongly fortified. Lissa, or San Giorgio, on the northeast shore, is the principal town and seaport, with a population of 5261. Issa was an ancient Greek colony from Lesbos; in the fourth century B.C. colonists came from Paros. The people helped the Roman general Duilius (q.v.); they aided the Romans also in the war with Macedon (215–211 B.C.). Issa became an important naval station for the Roman fleet. By the tenth century the Venetians had a foothold in the island. In Napoleon's time the French held the island till 1811; these years brought great prosperity to Issa. In 1812–15 the English held the island; in 1815 it was ceded to Austria. Off Lissa the Austrians under Admiral Tegethoff defeated the Italians under Admiral Persano July 20, 1866; this was the first battle at sea between modern ironclad fleets propelled by steam. Lissa was bombarded and captured by an Anglo-French fleet in the European War which began in 1914. See WAR IN EUROPE.

LISSA (Polish *Lészno*). A town in the Province of Posen, Prussia, 47 miles by rail from Posen (Map: Prussia, G 3). It has a palace with a park, an old town hall, a Gymnasium, and a Roman Catholic teachers' seminary. It manufactures wines, liquors, bricks, shoes, machinery, lumber, snuff, and cigars, and handles a considerable trade in cereals and cattle. Pop., 1900, 14,282; 1910, 17,156. The town formerly belonged to the Polish noble family of Leszczynski and became in the seventeenth century the centre of the Bohemian Brothers, who transferred there their educational institutions and their archives.

LISSAJOUS (lē̇'sȧ'zhōōz') **FIGURES.** A name given to certain phenomena designed to show optically the composition of vibratory motions. On April 6, 1857, Jules Antoine Lissajous presented to the Academy of Sciences in Paris a memoir on the optical study of vibratory movements, wherein he set forth that series of peculiar curves which have since borne his name, and which are generated by the combination of two vibrations taking place in the same plane, but at right angles to each other. (This work was anticipated in America by Nathaniel Bowditch, of Salem, in 1815.)

Suppose a body is vibrating back and forth between *E* and *W* (Fig. 1) in simple harmonic motion, when an impulse is given to it which alone would set it into similar vibration between *N* and *S*. Assume that the time of vibration of the two motions is the same, then the result of their combination will depend upon the relative "phase" of the two vibrations. Several characteristic cases may be considered as typical of the real infinity of possible variations. If the body tend to start from *O* towards *E* at the same instant that it tends to start from *O* towards *N*, then its real motion would be along the diagonal of the rectangle on *OE* and *ON*, and the resulting vibration would be as shown in Fig. 2 (*a*). This is the case where both harmonic cycles start at the same instant from the position of equilibrium, *O*; i.e., the difference of phase is zero. If it tend to start from *O* towards *N* and *W* simultaneously, then the resulting vibration will be shown at Fig. 2 (*e*). In this case the *EW* motion would have executed a half cycle when the *NS* commences; i.e., the phase difference is one-half.

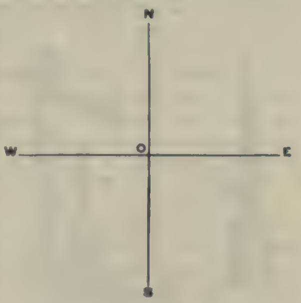


FIG. 1.

For a phase difference of one-quarter the body would be at *E* when the *NS* motion starts, and the result is shown in Fig. 2 (*c*). A phase difference of three-quarters would put the body at *W* when the other motion starts, and the figure would be the same as *c*, except that it would circulate in the opposite direction.

The result of a phase difference of one-eighth is shown in *b*, and that of three-eighths in *d*. If the amplitude of the two motions be the same, it is evident that Fig. 2 (*c*) would be a circle. A small weight or plumb bob hanging upon a string serves very well to illustrate the above forms of compound vibration.

FIG. 2.

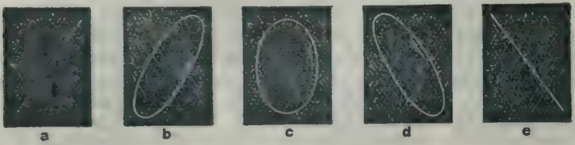


FIG. 3.

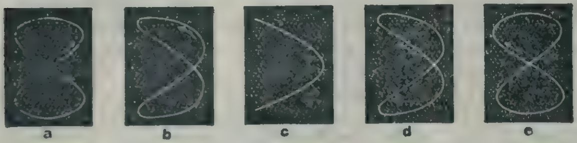
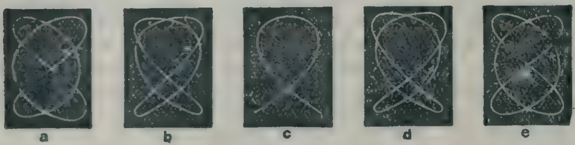


FIG. 4.



When the rates of vibration or periodic times of the two components are unequal, much more complex results are produced, which, however, reduce to comparative simplicity when the rate of one bears a simple ratio to the rate of the other. When the two rates are in the ratio of 1 to 2, there results a series of curves some of which are shown in Fig. 3, for phase differences of one-eighth, one-fourth, three-eighths, and one-half of the *EW* motion. Similarly Fig. 4 shows the corresponding curves when the rates of vibration are in the ratio of 2 to 3.

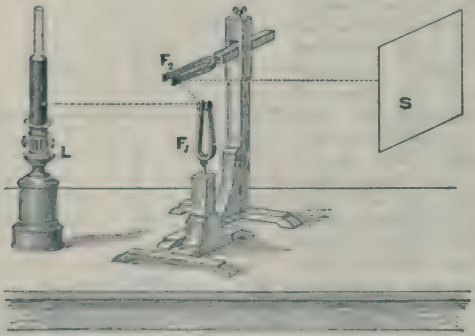


FIG. 5.

Lissajous attached a small mirror to one prong of each of two tuning forks of the same pitch. One fork is mounted vertically (F_1, Fig. 5) and the other horizontally (F_2). A ray of light from the lamp *L* is made to fall first on the mirror of the vertical fork, thence upon that of the horizontal fork, and finally on the screen *S*. If F_1 alone vibrates, then the spot of light on the screen will move up and down, owing to the tilting of the mirror on that fork. If F_2 is the only one in motion, the spot will move horizontally; and finally, if both vibrate simultaneously, then a combination curve will be exhibited, similar to some one of the forms of Fig. 2. If the two forks have different rates of vibration, then complex curves will appear; if one is the octave of the other, it will be of the class of Fig. 3; and Fig. 4 would be given by two forks having the interval of the fifth. In another form of apparatus for the same purpose the forks are replaced by two steel springs the rates of which can be varied by their length and by a small adjustable weight. Fig. 6 illustrates another method of showing these forms of vibration. The plumb bob *D* is free to swing perpendicular to the plane of the paper around the line *AB* with an effective length of the pendulum of *CD;* in the plane of the paper it can only swing around *E* with the effective length *DE*. By means of the sliding clamp *E* it is possible to adjust the two rates of vibration to definite ratios, and then the bob *D* will execute some one or all of the above curves. Many other methods have been devised for showing or drawing these curves.

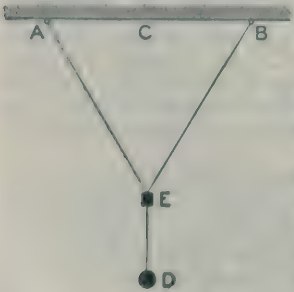


FIG. 6.

LIST, lĭst, FRIEDRICH (1789–1846). A German economist. He was born at Reutlingen in Württemberg. He was the son of a well-to-do tanner, but, as he had no taste for his father's trade, he entered the public service as a clerk and rose rapidly until in 1816 he attained the position of ministerial undersecretary. In 1817 he was appointed professor of political economy at Tübingen, but with the fall of the ministry which he supported he was forced in 1819 to resign his professorship. He was elected member of the Diet of Württemberg, but was expelled in 1822 for his censure of the acts of the government and was condemned to 10 months' imprisonment. He escaped, however, seeking refuge successively in Baden, Alsace, and Switzerland. In 1825 he came to Pennsylvania, where he tried farming, but soon abandoned it to become editor of a German paper in Reading. In 1827 he published a pamphlet entitled *Outlines of a New System of Political Economy*, in which he defended the doctrine of protection. The discovery of coal upon his property placed him in easy circumstances, and he turned again towards Germany, having received an appointment as United States Consul at Hamburg. But on his arrival in Europe in 1830 he found that the Senate had failed to confirm his appointment, and though about 1833 he was appointed Consul at Leipzig, he was *persona non grata* to the Saxon government and held the post for a short time only. At this time he was much interested in the establishment of railroads, and his insistence upon their advantages led to the building of the road between Leipzig and Dresden and contributed to the further development of the German system. He was tireless in his advocacy of protection and railroads and in the formation of associations of manufacturers for the cultivation of the influence of this class. In 1837 he went to Paris, where he wrote several letters for the Augsburg *Allgemeine Zeitung*, which were published in 1841 in a volume under the title of *Das nationale System der politischen Oekonomie.* In 1843 he established at Augsburg the *Zollvereinsblatt*, in which he advocated a national commercial system and a national fleet. He visited Austria and Hungary in 1844 and England in 1846, for the purpose of forming a commercial alliance between Germany and that country, in which his efforts were not successful. Depressed by the failure of his plans, the loss of his health and property, he shot himself in a fit of insanity. For his biography, consult: Goldschmidt (Berlin, 1878) and Jentsch (ib., 1901); also *Friedrich List, ein Vorläufer und ein Opfer für das Vaterland* (Stuttgart, n. d.; anonymous). See also article "Friedrich List" in Palgrave, *Dictionary of Political Economy* (London, 1894–99).

The chief contribution of List to economic thought is contained in *Das nationale System der politischen Oekonomie*, translated by S. S. Lloyd (new ed., 1905). In this work he emphasizes the idea that the economic policy of a nation should be such as to develop all of its resources, thus placing it in a position of independence. To this end he defended a protective system as necessary for a nation which has not developed its industry and commerce, although he regarded free trade as the goal towards which all nations should tend. He advanced few ideas in defense of protection which had not already been advanced by Alexander Hamilton, with whose work he was presumably familiar.

LISTA Y ARAGÓN, lē′stȧ ē ä′rȧ-gōn′, Alberto (1775–1848). A Spanish mathematician, educator, journalist, poet, and critic, born in Ariana, near Seville. Educated at the University of Seville in the humanities and theology, he showed wonderful ability in mathematical studies and became professor of mathematics at the age of 15 and six years after taught in the College of San Telmo. He became a priest at the age of 20. In 1808 he received the chair of rhetoric and poetics in the University of Seville and showed political independence in his *Semanario patriótico.* But when the French left Spain in 1813 Lista had to go, too, and did not return until 1817, when he was pardoned. In 1820 he founded and became head of the College of San Mateo, but his teachings were too liberal to be acceptable to the church, and he was again forced to leave the country in 1823, and the college was closed. He was recalled in 1833 and was made editor of the *Gaceta de Madrid*, and in 1837 professor of higher mathematics at Madrid. While at Madrid, he helped found the *Ateneo Científico, Literario y Artístico*, whose lecture courses often represent the most advanced instruction to be found in the city. Then he spent two years in the College of San Felipe Neri in Cadiz and in 1840 retired to Seville. He was incalculably influential with all the leaders of the younger generation in Spain. His *Poesías* (1822 and 1837) mark him as one of the greatest Spanish lyrists of the early part of the century. His *Canto del esposo*, an imitation of the Song of Solomon, is probably the best of his lyrics. As a critic, he showed a classic taste and a clear and correct style in *Ensayos literarios y críticos* (1844) and *Lecciones de literatura dramática española* (1839). He collected *Trozos escogidos de los mejores hablistas castellanos en prosa y verso;* rewrote Ségur's *Histoire universelle*, under the title *Curso de historia universal;* continued (1828) the *Historia de España*, written by Mariana and Miñana; and wrote a *Tratado de matemáticas puras y mixtas.*

LIS′TER, Joseph, first Baron (1827–1912). An English surgeon, father of modern antiseptic surgery. He was born, April 5, 1827, at Upton, Essex, the son of Joseph Jackson Lister. His early education was gained at schools for Friends. Entering University College, London, he took his degree of arts in 1847 and in medicine in 1854, and became fellow of the Royal College of Surgeons, London, in the same year, and of the Royal College, Edinburgh, in 1855. He studied at the University of Edinburgh in 1856, and at Edinburgh Royal Infirmary became assistant surgeon to Dr. James Syme (q.v.), whose daughter he married. He was thereafter successively professor of surgery at Glasgow (1860–69), professor of clinical surgery at Edinburgh (1869–77) and professor at King's College Hospital, London (1877–93). In 1878 he was appointed sergeant surgeon to Queen Victoria. Lister's earliest labors were in histology. His first investigations were directed towards proving the existence of ordinary unstriped muscle fibres in the iris. He made in addition many important observations on the early stages of inflammation and the coagulability of the blood. From the first he taught that pus in wounds was due to the decomposition of blood and serum, brought about in some way by the atmosphere, and insisted on scrupulous cleanliness and the use of deodorant solutions in his surgical wards. Before this carelessness of such precautions had characterized all hospitals. It was not until Pasteur in 1862 put forward his theory on fermentation and putrefaction that Lister fully realized that the formation of pus was due to bacteria. He at once set himself to apply the principles of antiseptics to the treatment of wounds, and the development of those principles revolutionized modern surgery. Lister was the recipient of many honors at home and abroad. In 1880 both Oxford and Cambridge conferred the degree of LL.D. upon him; he was made Baronet in 1883 and a peer in 1897, held the presidency of the Royal Society from 1895 to 1900 and of the British Association for the Advancement of Science in 1896, and in 1902 was appointed an original member of the Order of Merit. He died Feb. 10, 1912. Lister was a lucid thinker and writer. His many important papers appeared first in medical journals, notably the London *Lancet* and the *British Medical Journal*, and later were published in monograph form and as *The Collected Papers of Joseph, Baron Lister* (Oxford, 2 vols., 1909). The subjects treated include: the structure of muscle and nerve tissues, inflammation, coagulation of the blood, antiseptics (a world-famous series of essays), ligature of arteries, amputation, and anæsthetics (in Holmes's *System of Surgery*), etc. Consult, for an account of Lister's life, "Symposium of Papers Read before the Toronto Academy of Medicine" (Toronto, 1912); for an estimate of his importance, C. W. Saleeby, *Surgery and Society: A Tribute to Listerism* (New York, 1912); G. T. Wrench, *Lord Lister: His Life and Work* (ib., 1913). See Antiseptic.

LISTER, Joseph Jackson (1786–1869). An English microscopist, father of Joseph, first Baron Lister. He was born in London, assisted his father in the wine trade, and studied independently the mathematical and optical sciences.

In 1824 he made his first improvement in the achromatic microscope, and by 1830 he had worked out the principle of construction of the modern compound microscope—an invention that revolutionized scientific study. He aided A. Ross in 1837 in the invention of his famous ⅛-inch object glass, and by his advice gave invaluable assistance to other opticians in the construction of microscopes. Lister's law of aplanatic foci remained the underlying principle of microscopic science. He described some of his achievements in papers contributed to the *Philosophical Transactions*.

LIS′TON, JOHN (c.1776–1846). An English comic actor, of whose early history nothing is known, save that he studied at Soho under Dr. Barrow. He taught school for a time, was entirely unsuccessful in his first appearance on the stage as an amateur, and after some experience in tragic parts, playing at times with Mrs. Siddons, he discovered his comic powers. Despite his nervous and melancholy nature, he was very successful in old-man rôles and afterward as a clown. His dancing was good, and gradually he made himself a favorite with the London audiences. In 1823 he removed from Covent Garden to Drury Lane and in 1837 retired from the stage. During his last years his mind failed rapidly. Liston's gravity of deportment added much to his comic force, and he was highly praised by Lamb, Matthews, Colman, and by Leigh Hunt, who considered his rustics much better than his old men. The best rôles of Liston were Paul Pry, of which his treatment has become a tradition, Polonius, Slender, Bottom, Bob Acres, Bombasto Furioso, Apollo Belvie in Hook's *Killing No Murder*, Jacob Gawky in *The Chapter of Accidents*, and Grizzle in *Three and Deuce*. His wife, Miss Tyrer, whom he married in 1807, was a tiny woman, famous for her Queen Dollalolla in O'Hara's *Tom Thumb*.

LISTON, ROBERT (1794–1847). A Scottish surgeon, born at Ecclesmachan, in Linlithgowshire. He studied anatomy at Edinburgh and was made a surgeon to the Royal Infirmary. In 1835 he became professor of clinical surgery at University College, London. The skill and the rapidity with which he performed serious operations acquired for him a wide European reputation and an extensive surgical practice in London. His most important works are his *Elements of Surgery* (1831) and *Practical Surgery* (1837), the latter of which passed through several editions.

LISTOWEL, lis-tō′el. A town of Perth Co., Ontario, Canada, on the Maitland River, and on the Grand Trunk and Canadian Pacific railways, 60 miles by rail north-northeast of London (Map: Ontario, D 6). It contains a business college. Its manufacturing establishments include two builders' factories, chair and furniture factories, flour and oatmeal mill, creamery, knitting mill, and cigar factory. The town owns its water works and electric-lighting plant. Pop., 1901, 2693; 1911, 2289.

LISZT, list, FRANZ (1811–86). A famous Hungarian pianist and composer. He was born at Raiding, near Oedenburg, in Hungary, Oct. 22, 1811, and began his musical education at the age of six years. After three years' instruction he surprised his friends by playing a difficult concerto in public. The evidences of his genius were so patent that his father organized further concerts, which not only enhanced the boy's musical reputation, but gained for him many important friends and patrons among the Hungarian nobility. It was by means of their financial support that the young pianist was enabled to spend six years, completing his education, at Vienna, to which city his family removed in 1821. His teachers were the celebrated Czerny (piano) and Salieri (theory), men of strong artistic personality, who undoubtedly supplied the ballast that enabled him to resist the musical trickery in composition which at first beset his work. After a few public concerts in 1823, he and his father journeyed to Paris, with the view of securing for the boy admission to the Paris Conservatory, which, however, was refused him, owing to an old rule which excluded all foreigners. He, however, studied theory for a time under Paer and Reicha. His first operetta, *Don Sancho ou le château de l'amour*, was produced in 1825. Two years later his father died, upon which he gave up his concert work and settled as a teacher in Paris. Contemporary critics described him as "a pianist, the most extraordinary and fascinating ever known, and one of the most wonderful of improvisators." His early piano compositions were in the style and fashion of the period and were largely paraphrases upon popular or fashionable operas, in which art was frequently sacrificed to a sort of trickery, whole passages being so written as to be practically impossible to any one but himself. He met with immediate success as a teacher, the aristocratic patrons and friends of his boyhood rallying to him and enabling him to satisfy every social as well as musical ambition. The appearance of Paganini in Paris in 1831 inspired him to become as great a virtuoso on the piano as that master was on the violin. He was of a peculiarly impressionable temperament and was in turn strongly affected by the political happenings of the period, the ceremonialism of the Church, the genius of Beethoven, Weber, Chopin, Berlioz, Schumann, and Wagner; besides which he experienced several affairs of the heart, the most serious of which was his *liaison* with the authoress "Daniel Stern" (the Countess d'Agoult). Together they retired to Geneva (1835), where three children were born to them, two daughters and a son. Cosima, the youngest of the daughters, married first Hans von Bülow (1857), and, after separating from him in 1869, became the wife of Wagner, of whom her father was a mighty champion. In 1839 he reappeared in public with signal success, his only serious competitor being Thalberg (q.v.), whom he easily outrivaled. In 1849 he became kapellmeister to the Grand Duke of Weimar, a post which he relinquished in 1861. Four years later he took minor orders in the Catholic church and was subsequently known as the Abbé Liszt. During his period of service at Weimar occurred the really great events of his life.

In 1847 he had met the Princess Karoline Sayn-Wittgenstein, who united her life to his and induced him to renounce the career of the virtuoso. Their residence in Weimar, the Altenburg, became the centre of musical activity of almost all the younger artists who were in sympathy with the newest tendencies. The first performance of *Lohengrin* in 1850 under Liszt's direction marks the beginning of that effective propaganda for the works of Wagner which culminated in the establishment of the Bayreuth festivals. Here Liszt was enabled to discover, help, and introduce many artists of whom the world came to be proud; he advanced most thoroughly the school of music to which he belonged, and which has since been described in the history of music as the New German school, whose characteristic was a freedom from the old classical rules of tonality and form. Here also he began his second period of composition, by which alone he is to be judged as a composer. His work was now characterized by his own individuality as a creative artist and marked by the inherent mysticism of his nature.

He originated the form of the *Symphonic Poem* (q.v.), which became the most important factor in the development of modern programme music. It is not a continuation of the symphony, but an entirely new form, transferring the principles of Wagner's dramatic style into the realm of pure instrumental music. He also presented notable works of Raff, Schumann, Cornelius, and Berlioz. In fact, he became the champion of all new works of merit. In 1875 he was elected president of the Hungarian Academy of Music at Pest, between which city, Weimar, and Rome he spent the last few years of his life. With the passing of time critical musical opinion has come to be widely divergent regarding the value of his work and his place in the list of great composers; but, contradictory as the differing estimates have been, he is unhesitatingly conceded to have been a man of genius. To-day the consensus of the best authorities is that Liszt failed to realize his lofty ideals as a composer because of lack of real power of thematic invention. As a pianist, he has never been excelled, and, together with Chopin and Schumann, he firmly established the modern style of writing for the piano. His literary works, published in six volumes (Leipzig, 1880–83), are of permanent value, not only because of their critical acumen, but also because of their finished literary style, whether written in German or in French. Few great men have been more loyal to their friends and convictions than was Liszt, and still fewer have been so greatly beloved or so highly honored by the world. He died in the midst of a Wagner festival at Bayreuth, July 31, 1886.

The sum total of Liszt's compositions comprises 1233 numbers, of which 1122 have been printed. Of these 385 are original works, 264 arrangements of some of them for other instruments, 442 transcriptions and arrangements of works of other composers, and 31 revised editions of classical masterpieces. Foremost among Liszt's original works stand his 13 *Symphonic Poems*, and the *Faust* and *Dante* symphonies for orchestra; his great choral works *Graner Festmesse*, *Ungarische Krönungsmesse*, and the oratorios *Christus* and *Legende von der heiligen Elisabeth*. Of his piano works the *Harmonies poétiques et réligieuses*, *Années de Pélerinage*, *Légendes*, *Polonaises*, *Hungarian Rhapsodies*, and *Sonata* in B minor are in the repertory of every concert pianist, as well as his two concertos for piano and orchestra in E flat and A, and his *Totentanz* and *Wanderer Fantasie* (after Schubert), which to all intents and purposes are concertos for piano and orchestra. Besides these works, he wrote other masses, much sacred music, *a capella* choruses, organ pieces, and songs. A complete list of Liszt's published works was compiled by August Göllerich and appeared in the *Neue Zeitschrift für Musik* (1887–88). A complete thematic catalogue by the same author is in preparation.

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LISZT, Franz von (1851–). A German authority on criminal law, born in Vienna, Austria. He studied at the universities of Vienna, Göttingen, and Heidelberg; lectured on penal law and civil processes at Graz in 1875–79; and became professor at Giessen in 1879, at Marburg in 1882, at Halle in 1889, and in 1899 at Berlin, where he was also director of the criminal-law seminar. In 1881 he founded, with A. Dochow, the *Zeitschrift für die gesamte Strafrechtswissenschaft*, and in 1888 he organized, with Professors Van Hamel and Prins, the Internationale Kriminalistische Vereinigung. Liszt became known as the greatest expert on criminal law in Germany and as a leading exponent of the scientific treatment of criminals. He was elected a member of the Reichstag in 1912. His publications include: *Meineid und falsches Zeugnis* (1876); *Die falsche Aussage vor Gericht* (1877); *Lehrbuch des österreichischen Pressrechts* (1878); *Das deutsche Reichspressrecht* (1880); *Lehrbuch des deutschen Strafrechts* (1881; 18th ed., 1911); *Der Zweckgedanke im Strafrecht* (1882); *Die Reform des juristischen Studiums in Preussen* (1886); *Der italienische Strafgesetzentwurf* (1888); *Die Deliktsobligationen im System des bürgerlichen Gesetzbuchs* (1898); *Das Völkerrecht, systematisch dargestellt* (1898; 9th ed., 1913); *Strafrechtliche Aufsätze und Vorträge* (2 vols., 1905).

LI TAI-PEH, lē tī-pĕ (c.700–763). One of the greatest of the Chinese poets, sometimes called Li Po. Born in a far western province, he became a member of a bacchanalian group of six young poets, wandered here and there, and, if we are to credit legend, spent several years in the mountains writing, singing, and drinking with his comrades. About 742 he went to the capital and became a client of the great minister Ho Shi-chang and later a court favorite of the Emperor Ming-hwang. But he was forced to flee from the palace because of intrigue, or possibly merely because of the dislike of the Emperor's favorite wife. According to Chinese story, he was drowned one night as he reached to kiss the moon's reflection at the side of his boat—plainly a materialization of one of his dainty conceits. More probably he died under the protection of Li Yang-pang after receiving Imperial forgiveness for his many attempts against the dynasty. One of the most popular of Chinese poets, Li Tai-peh is called the *prince of poetry*, the *great doctor*, and the *immortal who loved wine.* His poetical skill was versatile, and his subjects were varied. Much of his poetry has a touch of Anacreon, but in all there is a keen appreciation of the beauties of nature and most of all of the beautiful moon. Some selections are translated in Giles, *Chinese Literature*, pp. 152 et seq. (London, 1901), and in D'Hervey de Saint-Denys, *Poésies de l'époque des Thang*, pp. 1–72 (Paris, 1862).

LỊT'ANY (Lat. *litania*, from Gk. *λιτανεία*, *litaneia*, entreaty, from *λιταίνειν*, *litainein*, to entreat, from *λίτεσθαι*, *litesthai*, to pray, from *λιτή*, *litē*, prayer). In general, a solemn act of supplication to God. The first litanies were supplicatory processions, imitated from the pre-Christian religious processions. In all forms of litany the prayer alternates between the priest or other minister, who announces the object of each petition, and the congregation, who reply in a common supplicatory form, the most usual of which was the well-known "Kyrie eleison!" (Lord have mercy!). In one procession which Mabillon describes, this prayer, alternating with "Christe eleison," was repeated 300 times; and in the capitularies of Charlemagne it is ordered that the "Kyrie eleison" shall be sung by the men, the women answering "Christe eleison." From the fourth century downward, the use of litanies was general. The *Antiphonary* of St. Gregory contains several. In the Roman Catholic church three litanies are especially in use—the Litany of the Saints (which is the most ancient), the Litany of the Name of Jesus, and the Litany of Loreto. Of these, the first alone has a place in the public service books of the church, on the rogation days, in the ordination service, the service for the consecration of churches, the consecration of cemeteries, and many other offices. Although called Litany of the Saints, the opening and closing petitions, and indeed the greater part of the litany, consist of prayers addressed directly to God; and the prayers to the saints are not for their help, but for their intercession on behalf of the worshipers. The Litany of Jesus consists of a number of addresses to him under his various relations to men, in connection with the several details of his passion, and of adjurations of him through the memory of what he has done and suffered for the salvation of mankind. The date of this form of prayer is uncertain, but it is referred, with much probability, to the time of St. Bernardino of Siena, in the fifteenth century. The Litany of Loreto, so called because it has for ages been solemnly sung every Saturday in the chapel of the Holy House at Loreto, resembles both the above-named litanies in its opening addresses to the Holy Trinity, and in its closing petitions to the "Lamb of God, who taketh away the sins of the world"; but the main body of the petitions are addressed to the Virgin Mary under various titles—some taken from the Scriptures, some from the language of the Fathers, some from the mystic writers of the mediæval Church. The litany in the Prayer Book of the English church, although it partakes of ancient forms, contains no invocation of the Virgin or the saints. It is divided into four parts—invocations, deprecations, intercessions, and supplications—in which are preserved the old form of alternate prayer and response.

LITCH'FIELD. A borough and the county seat of Litchfield Co., Conn., 30 miles by rail northeast of Danbury, near Bantam Lake, the largest lake in the State, and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, C 2). It has the Noyes Memorial Library, beautiful parks, and many places of historic and scenic interest. The borough is the centre of large dairying interests, and there are some manufactories, supplied with water power from the outlet of Bantam Lake. Situated 1100 feet above the sea, it is also a popular summer resort. Pop., 1900, 1120; 1910, 903.

Litchfield was settled in 1720, and several years later its present name was adopted. The borough was laid out in 1751 and incorporated in 1879. During the Revolution it was used for a time as a depot of supplies, and in 1776 the statue of George III, which on July 9 was torn down on Bowling Green, New York, was sent here and was melted and cast into bullets by the women of Litchfield. The first law school in the United States was founded here in 1784 by Judge Tapping Reeve. Many of the most eminent jurists and statesmen of the country, including five cabinet ministers—Calhoun, Woodbury, Mason, Clayton, and Hubbard—were trained here. In 1792 Miss Sarah Pierce opened in Litchfield one of the first institutions in America for the higher education of women. It was called the Litchfield Female Seminary, and flourished for about 40 years. Lyman Beecher was pastor of the First Congregational Church from 1810 to 1826, and it was in Litchfield that both Henry Ward Beecher and Harriet Beecher Stowe were born. Litchfield was also the birthplace of Ethan Allen, John Pierpont, and Charles Loring Brace; and the home for many generations of the distinguished Wolcott family. Consult: Kilbourne, *Sketches and Chronicles of the Town of Litchfield* (Hartford, 1859); the *Litchfield Book of Days* (Litchfield, 1900); and an article by Kilbourne, in the *Connecticut Quarterly*, vol. ii (Hartford, 1896).

LITCHFIELD. A city in Montgomery Co., Ill., 52 miles northeast of St. Louis, Mo., on the Wabash, the Cleveland, Cincinnati, Chicago, and St. Louis, the Illinois Central, the Chicago, Burlington, and Quincy, the Illinois Traction, and the Litchfield and Madison railroads (Map: Illinois, E 7). It has a Carnegie library, two hospitals, a fine Federal building, and parks. There is an abundance of coal, natural gas, and oil in the vicinity. Mining and manufacturing are the leading industries, the principal industrial establishments being manufactories of radiators, lamps, oil cans, windmills, and mine engines, flour mills, brick and tile plants, foundries, glassworks, and briquet works. Litchfield, incorporated in 1859, is governed by a mayor, elected every two years, and a unicameral council. Pop., 1900, 5918; 1910, 5971.

LITCHFIELD. A village and the county seat of Meeker Co., Minn., 65 miles west by north of Minneapolis, on the Great Northern Railroad (Map: Minnesota, C 5). It is of considerable importance as the commercial centre of a grain, dairy, and live-stock region, and has several grain elevators, a foundry, and machine shops, and manufactures dairy products, lumber, woolen goods, carriages and wagons, etc. The city contains a Carnegie library and owns its water works, electric-light and heating plants. Pop., 1900, 2280; 1910, 2333.

LITCHI, or **LEECHEE,** lē'chē' (Neo-Lat., from Chin. *lichi*), *Litchi chinensis* or *Nephelium litchi*. A large evergreen tree of the family Sapindaceæ, native of China and the Malay Peninsula, and extensively grown in many tropical countries. It is highly prized for its fruit, which is said to be one of the most delicious known. It is cultivated in the West Indies, and attempts have been made to introduce the trees in Florida, but with little success, as the tree is very susceptible to injury by cold and thrives only in the extreme southern part of the State. It is reported as tolerant of the conditions found in parts of southern California. The fruit is a nut an inch or more in diameter, which consists of a thin, rough, brittle shell within which is a sweet pulp surrounding a hard seed. The pulp separates readily from the seed and is eaten fresh, dried, or as a sort of preserve. In the dried state the nuts keep a long time, and it is mostly in this form that they are found in commerce. Chinese and Japanese stores usually keep them in stock. The fruit is principally used as a confection, sugar being one of the chief constituents of the pulp. Fruits of species of *Nephelium* resemble the litchi and are used in a similar manner. The principal ones are the rambutan (*Nephelium lappaceum*), which has a bright-red fruit covered with soft spines; and the longan (*Nephelium longana*), a tree of moderate size and fine appearance, which is readily cultivated, the fruit of which is smaller and inferior to the litchi. Some botanists combine the two genera under the name *Nephelium*.

LITCHI.

LIT DE JUSTICE, lē dĕ zhu̧s′tēs′. See Bed of Justice.

LITER, lē′tĕr. A measure of volume. See Metric System.

LIT′ERARY PROPERTY. Property in ideas, expressed in written or printed language. Literary property, as defined by Drone, is "the exclusive right of the owner to possess, use, and dispose of intellectual productions," and copyright is "the exclusive right of the owner to multiply and dispose of copies of an intellectual production." The English statute (5 and 6 Vict.) defines copyright to mean "the sole and exclusive liberty of printing or of otherwise multiplying copies of any subject to which the word is herein applied." The American statute (U. S. Rev. Stat., sec. 4952) speaks of copyright in a book as "the sole liberty of printing, reprinting, publishing, . . . and vending the same."

Property in an intellectual production, comprising the exclusive right of multiplying for sale copies of literary or of art productions, is of comparatively recent date. Whatever theories might have been held during the time of the Roman state in regard to the rightfulness of the claim of the author to enjoy the usufruct of all the copies of his production, the manifest impossibility of securing, under the conditions then obtaining, by any process of law or any application of the authority of the state, the control of such usufruct, prevented the lawyers of the time from giving any serious attention to the question. In these earlier discussions as to the nature of property in ideas, special attention was given to the question whether such property should take precedence over that in the material which happened to have been utilized for the expression of the ideas. The jurist Tribonian, who was selected by Justinian to supervise the preparation of the Justinian Code, followed an opinion of Gaius (given about 150 A.D.) which, having reference to the ownership of a certain tablet upon which a picture had been painted, gave the tablet to the artist. This decision contains an unmistakable recognition of immaterial property, not, to be sure, in the sense of a right to exclusive reproduction, but in the particular application that, while material property depends upon the substance, immaterial property, i.e., property in ideas, depends upon the form.

Apart from the difficulty of preventing the appropriation of their literary productions, the feeling on the part of the Roman writers that authorship was not in itself a worthy vocation, but was to be considered simply as a pastime, unquestionably stood in the way of arrangements under which authors secured compensation for their productions, and doubtless postponed for a considerable period the recognition by the publishers and by the reading public of any property rights in literature. It appears from the letters of Cicero, Horace, Martial, and others that they made a profit from the sale of their writings.

For the centuries following the destruction of the Roman Empire, during which literary undertakings were confined almost entirely to the monasteries, the Roman usage, under which authors could dispose of their works to booksellers and the latter could be secure of some commercial control of the property purchased, was entirely forgotten. No restrictions were placed on the duplication of works of literature. The statutes of the University of Paris, issued in 1223, provided that the booksellers of the university were to produce duplicate copies of all the texts authorized for the use of the university. Throughout the Middle Ages, whatever immaterial property in realms of science or of art obtained recognition and protection was held in ownership, not by individuals, but by churches, monasteries, or universities. The writers of the Middle Ages were satisfied when they could succeed under any conditions in getting their productions before the public.

The printing press brought with it the possibility of a compensation for literary labor. Very speedily, however, the unrestricted rivalry of printers brought into existence competing and unauthorized editions, which diminished the prospects of profit, or entailed loss, for the authors, editors, and printers of the original issue, and thus discouraged further undertakings. As there was no general enactment under which the difficulty could be met, protection for the authors and their representatives was sought through special privileges obtained for separate works as issued. The earliest privilege of the kind was that conceded by the Republic of Venice in January, 1491, to the jurist Peter of Ravenna, securing to him and to the publishers selected by him the exclusive right for the printing and sale of his work *Phœnix*. No term of years was named in this privilege. The larger number of the earlier Italian enactments in regard to literature were framed not so much with reference to the protection of authors as for the purpose of inducing printers (acting also as publishers) to undertake certain literary enterprises which were believed to be important to the community. The Republic of Venice, the dukes of Florence, and Leo X and other popes conceded at different times to certain printers the exclusive privilege of printing for specific terms (rarely exceeding 14 years) editions of classic authors; not so much to secure profits for the printers, but rather to encourage, for the benefit of the community, literary ventures on the part of the editors and printers.

In France, from the reign of Louis XII to the beginning of the sixteenth century, it became the usage for the publisher, before undertaking the publication of a work, to obtain from the King an authorization or letters patent, the term of which varied according to the nature of the work and also to the mood of the monarch or of the advising ministers. The status of literary property was further recognized and defined by the so-called *Ordonnances des Moulins* of Charles IX in 1566 and the letters patent of Henry III in 1576, but the general method under which copyrights were granted and defended remained practically the same. These royal letters were for the most part in the earlier years, as has been the case in Italy, issued for the protection of special editions of the classics. They were concerned, therefore, not with the protection of original ownership, but with the encouragement of investments on the part of the printer publishers in scholarly undertakings. In so far as these editions included original work (in connection with the revision or annotation of the texts), this work had been paid for by the publishers, who stood, therefore, in the place of the writers. The National Assembly in 1789 abolished all royal privileges then in force for the protection of works of literature. In July, 1793, the first general Copyright Act was passed. This gave protection to the author during his life and to his heirs and assigns for 10 years thereafter. The Imperial Act of 1810 extended the term in behalf of the author and his widow for life, and of their children for 20 years. The Law of March 28, 1852, prohibited the production in France of unauthorized editions of foreign works. The Law of April 8, 1854, increased the term in behalf of the children to 30 years, while the Act of July 14, 1866, increased the period of protection in behalf of heirs to 50 years after the death of the author. The decree of the 9th of December, 1857, declared the copyright legislation of France applicable to the French colonies named, and subsequent copyright legislation was made applicable in all the colonies by the decree of Oct. 29, 1887. The provisions of these acts apply equally to foreigners and to Frenchmen, and no restriction is made as to the author's residence at the time the copyright is taken out. In case the work be first published abroad, copyright in France may be secured subsequently by the deposit of two copies with the Minister of the Interior or with the secretary of the prefecture in the departments. The most important modifications of this act have been in connection with the Convention of Bern of 1886–87 and the convention with the United States in 1891, reference to which will be made later.

The earliest German privilege of which there is trustworthy record was issued in 1501 by the Aulic Council to an association entitled the *Sodalitas Rhenana Celtica*, for the publication of an edition of the dramas of Hroswitha of Gandersheim, which had been prepared for the press by Konrad Celtes. This Hroswitha privilege, while later than the early Venice privileges, antedates by two years the first instance in France, and by 17 years the first in England. After 1501 there is a long series of Imperial privileges issued directly by the Imperial Chancellor in the name of the Emperor. In 1512 an Imperial privilege was issued to the historiographer John Stadius for all that he should print, the first European privilege which was made to cover more than a single work or which undertook to protect books not yet published. An Imperial patent of 1685 uses the terms (as if in antithesis to each other) "A privileged book" and "A book purchased from its author." Later we find references to "privileged" and "non-privileged" books. Pütter (who may be called the father of the modern theory of property in literary productions), writing in 1774, uses for the unprivileged books the term *eigenthümlich* (individual) and for the privileged the term *nichteigenthümlich* (nonindividual). Literary piracy in Germany began almost at once with the invention of printing. Before manuscript copies had been replaced by printed books the possession of a manuscript was held to carry with it the right to make copies of the same *ad libitum*. As a natural consequence of this practice the possession of a printed copy of a work was for a considerable time also believed to carry with it the right to make and dispose of further printed copies, and the first upholders of an author's copyright found themselves obliged to contend against the claim of ancient precedent. Early in the history of the German book trade there arose, however, a practice among the leading publishers of respecting each other's undertakings, irrespective of any privileges or of other legal protection given to the works in question. To this practice there were, of course, numerous exceptions, but it exercised nevertheless, during the period previous to the existence of a national copyright system, an important influence in indicating the tendency of the book trade and that of the reading public to a recognition of and a respect for literary property. It also placed the publishers in a better position to make satisfactory payments to the authors or editors employed by them. The many important publications of Koberger of Nuremberg, whose business activity dated from 1473, were issued entirely without privilege, and with a few exceptions were not interfered with by rival publishers. In 1532 the magistrates of Nuremberg, acting on behalf of the widow of Albert Dürer, enjoined Hans Güldemund from reëngraving the *Triumphwagen* and selling impressions of his plate. In the same year these magistrates cautioned all the booksellers of Nuremberg against keeping in stock or selling any copies of a certain unauthorized edition of Dürer's *Instruction in Perspective*. Under the order of the magistrates of the city of Basel, issued in

October, 1531, printers of books in that city were enjoined for a period of three years, under the penalty of 100 gulden, from reprinting or pirating the books of one another. Until nearly the end of the eighteenth century the protection of literary property in Germany depended upon a system of privileges, Imperial or local, but these privileges were for the most part concerned simply with the property interests of the publishers and printers, but a small proportion of them having to do with modern books or with the rights of living authors. Such privileges covered at the outset three classes of literary undertakings: first, official publications—a term including in the earlier times the service books of the Church and school textbooks, as well as the authorized text of government edicts, laws, and enactments; second, editions of works taken from the body of the world's literature (*literarisches Gemeingut*), i.e., the first printing (*Vordruck*) of the same; and third, new books presenting the first consideration of a specific subject, more particularly of a scientific, technical, or practical nature. For this last class of undertaking the recipient of the privilege claimed a control not only of the specific book which he had produced or of which he was the owner, but the monopoly for the time being, within the district covered by the privilege, of the subject considered in such book. The writer who had produced a book on "The Use of Herbs," or the publisher who had employed a writer to prepare such a book (the subject not having been treated before or at least not recently), would consider himself aggrieved and would contend that his rights had been infringed if within the same territory the publication of another book on herbs should be permitted. If the privilege covered an edition of a Latin author, the holder believed himself authorized to prevent the publication, within the territory covered by his privilege, of any other edition of the same author, even though such competing edition might, in respect to the revision of the text and to the editorial work in the notes and commentaries, be entirely distinct from his own. Local privileges of this kind, which undertook to give to the possessor an exclusive control, during a certain term, over a specified classic text, were, of course, practically identical with the trade monopolies, also characteristic of the age, which were conceded for the sale, within specific territories, of articles such as salt or wool.

In 1794 legislation was inaugurated in the Prussian Parliament which was accepted by the other states of Germany (excepting Württemberg and Mecklenburg), under which all German authors and foreign authors whose works were represented by publishers taking part in the book fairs in Frankfort and Leipzig were to be protected throughout the states of Germany against unauthorized reprints. This Berlin enactment may be credited as the first step towards a practical recognition of international copyright. It proved, however, difficult, at least until after 1815, to enforce the provisions of these interstate enactments.

The first copyright privilege in England bears date 1518 and was issued to Richard Pynson, King's printer, the successor, second in line, to Caxton. The privilege gives a monopoly for the term of two years. The date is 15 years later than that of the first privilege issued in France. In 1530 a privilege of seven years was granted to an author in consideration of the value of his work. This is cited by Scrutton as the first record of an English copyright issued to an author. Royal privileges continued to be issued during the sixteenth century, while, after 1556, the entries in the registers of the Stationers' Company are made evidence of the exclusive rights to the persons named for printing the books specified. The Stationers' Company, in giving title to property in a "copy" or literary production, acted as the representative of the authority of the crown, an authority secured to it through royal charter. The control of the work of the Stationers was, in 1637, placed in the hands of the Star Chamber. The replacing in 1640 of the absolutism of the Star Chamber by the absolutism of the Long Parliament made no change in the completeness of the authority left with the Stationers' Company. The Parliamentary Ordinances of 1641, in prohibiting printing or importing without the consent of the owner of "copies" of books, constituted a clear statutory recognition of property in "copy," a recognition evidently based upon its existence under the common law. The Act of 1643 for "redressing disorders in printing," and the Licensing Act of 1662, while having for their main purpose the control of literature in connection with its influence on politics, continued to affirm or to imply the existence of property in the "copy" of books. The English authorities on the subject, Maugham, Coppinger, Scrutton, and others, and the American Drone, are at one in the opinion that at the close of the seventeenth century it was the general understanding in England that authors possessed in their productions a perpetual right of property and that this right could be assigned. This understanding, upon which were based parliamentary acts for regulation and for license, and in accord with which were carried on important and continued business undertakings, marked a development in the conception of literary property which had not then been reached elsewhere. The Act of Queen Anne, which went into effect in 1710, under which a statutory protection for a term of 14 years was given to the author of a literary production (with provision that if he were alive at the expiration of that period his copyright could be extended 14 years), brought to a close, for Great Britain, the period of common-law copyright. This result was probably not intended by the legislators who framed the act and was certainly not anticipated by the publishers at whose instance the matter had been taken up and who were simply applying for a more specific and more effective protection, covering such term as Parliament might see fit to grant, for the property in their "copies," of the existence of which property there had as yet been no question. It was, in fact, not until 1769 that any serious contention was raised against the continued validity of copyright at common law. In that year the common-law right was maintained in the decision rendered in the famous case of Millar *v.* Taylor, a decision rendered the more noteworthy because it was concurred in by Lord Mansfield, the greatest authority on the subject of copyright whom Europe had thus far known. In 1774, in the case of Donaldson *v.* Becket, the issue was raised for the second time, the property involved being the same in each suit, the copyright of Thomson's *Seasons*. In this case the House of Lords reversed its previous decision. Its conclusions were in substance:

first, that an author had a common-law right to his production before publication (10 judges in the affirmative and one dissenting); second, that, after publication, such common-law right still rested in the author (eight judges in the affirmative and three in the negative); third, that, under the Statute of 1710, the author had lost his right of action at common law and retained protection for his copyright only during the term prescribed by the statute (six judges in the affirmative and five in the negative); fourth, that the right at common law possessed by the author and his assigns prior to 1710 had been a right in perpetuity (seven judges in the affirmative, four in the negative). In each of these votes, including that of the vital issue of the effect upon the common-law right of the Statute of 1710, Lord Mansfield was recorded in favor of the continued right of the author at common law, and of the perpetuity of copyright, irrespective of the effect of this statute. The effect of this decision was, as said, to replace what may be called the common-law period of a copyright in England by a copyright protection limited to the terms of the successive statutes.

The copyright law now in force in Great Britain is in substance that of 5 and 6 Vict., c. 45, enacted in 1842, with amendment of 1862 for paintings and photographs. Exclusive right to perform dramatic pieces is given by the Statute of 1833. Sculpture is provided for under the Act of 1813.

The copyright act was the result of a parliamentary movement initiated by Sergeant Talfourd, conducted later by Lord Mahon. Under Talfourd's Bill of 1841 it was proposed to extend the term of copyright to a period of 60 years from the death of the author. The principal opponent of this longer term was Macaulay, at that time a member of the House. Macaulay's views prevailed, and the Talfourd Bill was defeated. The term finally arrived at was that suggested by Macaulay, and it was also at his instance that the provision was added against a possible suppression of books by the owners of the copyright.

In the United States the first Act in regard to copyright was passed in Connecticut in January, 1783. This was followed in the same year by the acts of Massachusetts, Maryland, New Jersey, New Hampshire, and Rhode Island, and before May, 1786, all of the other original States except Delaware had passed similar acts. These acts were due more particularly to the efforts of Noah Webster and their first service was the protection of his famous *Speller*. Webster journeyed from State capital to State capital to urge upon governors and legislatures the immediate necessity of copyright laws, and his persistent efforts were crowned with success. The necessity for State laws on the subject was, however, obviated by the United States Statute of 1790. Previous to the adoption, in 1787, of the Federal Constitution, a general copyright law was not within the province of the central government, and in order to encourage the States in the framing of copyright legislation a resolution, proposed by Madison, was adopted in Congress in May, 1783, recommending to the States the adoption of laws securing copyright for a term of not less than 14 years, with right of renewal for 14 years more. Certain of the State acts granted longer terms. The Act of 1790, however, provided for the double term suggested by Madison. The Act of 1831 extended the 14 years to 28, with the privilege to the author, his widow, or the children, of renewal for 14 years more. The statute law relating to copyright is to be found in U. S. Rev. Stat., Tit. 60, c. 3 (1874), with later amendments, of which those of March, 1891, introduced international provisions. Under the interpretation of the United States courts, copyright in published works exists only by virtue of the statute, while in the works that have not been published, such as compositions prepared for dramatic representation, the copyright obtains through the common law. The United States decision which still serves as a precedent on the point of statutory limitation of copyright is that of the United States Supreme Court in 1834 in the case of Wheaton *v.* Peters. This decision involved the purport of the United States Law of 1790 and the determination of the same question that had been decided by the House of Lords in 1774, viz., whether copyright in a published work existed by the common law, and if so, whether it had been taken away by statute. The court held that the law had been settled in England, the Act of 8 Anne, c. 21, having taken away any right previously existing at common law; and that the Copyright Statute of 1790 did not affirm a right already in existence, but created one; and finally, that there was no common law of the United States in force. Justices Thompson and Baldwin, in opposing the conclusions of the four justices concurring in this decision, took the ground that the common law of England *did* prevail in the United States, that copyright at common law had been fully recognized, and that even if it were admitted that such copyright had been abrogated in England by the statute of Anne, such statute had, of course, no effect either in the colonies or in the United States. In 1880, in the case of Putnam *v.* Pollard, it was claimed by the plaintiff that the decision in Wheaton *v.* Peters could, in any case, only make a precedent for Pennsylvania; that the English common law obtained in the State of New York, and could not have been affected by the statute of Anne; but the New York Supreme Court decided that Wheaton *v.* Peters constituted a valid precedent.

International Copyright. The first country to take action in regard to international copyright was Prussia, which in 1836 passed an Act conceding the protection of the Prussian statute to the writers of every country which should grant reciprocity. In 1837 a copyright convention was concluded between the different members of the German Confederation. This was confirmed in 1870 between the states which were then brought together in the newly constituted German Empire. In 1838 an Act was passed in England under which the crown might, by order in council, grant the privilege of copyright to authors of books first published in any foreign country, to be named in such order, provided always that "due protection had been secured by the foreign Powers so named for the benefit of parties interested in works first published in British dominions." Under this act Great Britain entered into copyright conventions with Saxony, 1846; Hanover, 1847; France, 1851; Prussia, 1855; Belgium, 1855; Spain, 1857; Sardinia, 1862; and Italy, 1867. Interstate conventions were also arrived at during the same period between most of the literature-producing states of Europe, the noteworthy exceptions being Belgium (which profited largely through the unauthorized reprinting of books originating in

France), Holland, and Hungary. In 1887, under the Bern Convention, the states of Europe and certain states outside of Europe united in a copyright system which protected, throughout the territory of the states that were party to the convention, the works produced in each of these states. The states taking part in this international union comprised at the outset Great Britain (including the British colonies), Germany, France, Belgium, Spain, Italy, Switzerland, Haiti, and Tunis. Since 1887 the following states have come into the union: Luxembourg, Monaco, Montenegro, Norway, Japan, and Denmark. The most noteworthy exceptions, among the literature-producing countries, to membership in the convention are Holland, Russia, Austria-Hungary, and the United States. In 1896 a diplomatic conference met in Paris to discuss a revision of the Bern Convention, and drew up a modification known as the Act of the 4th of May, 1896. The association maintains a permanent bureau at Bern, and under its initiative conferences have been held at brief intervals through the action of which the provisions of the union have been perfected. In 1901 the International Publishers' Association established at Bern a permanent bureau whose work is carried on in coöperation with that of the Bern Convention.

In the United States efforts to secure international copyright relations extended over a period of more than 50 years. In 1837 Henry Clay presented to Congress a petition of British authors asking for American copyright. In 1843 George P. Putnam presented to Congress a memorial drafted by himself, and signed by 97 publishers and printers, in which it was stated that "the absence of an international copyright was alike injurious to the business of publishing, and to the best interests of the people at large." In 1841 was organized the first International Copyright Association, of which George P. Putnam was the secretary. Between that date and 1891, 14 copyright measures were introduced into Congress. In 1887 the American Copyright League, composed in the main of the authors of the country, appointed an executive committee to take action to further the measures then pending in behalf of international copyright. Of this committee Mr. R. U. Johnson was, during the greater part of its activity, the secretary. In the same month was organized the American Publishers' Copyright League, with W. H. Appleton as president and G. H. Putnam as secretary. In 1891 was finally secured the enactment of the bill, drafted under the direction of the Publishers' League, which made such modifications in the existing statute as to concede copyright in the United States to the authors of foreign states in which American authors were placed in a position to secure similar copyright protection. The most important limitations in the copyright as granted in the Act of 1891 were the requirements that the foreign book to secure protection of the American statute must be produced from type set within the limits of the United States, and that two copies of the book so produced must be deposited in the Library of Congress not later than the date of publication of the work in this or any foreign country. The requirement that the work of an American author should, in order to secure copyright in this country, be manufactured in this country was new. While, through the passage of the Act of 1891, the United States had finally put itself on record in company with the other civilized states of the world in recognizing the property rights of literary producers, it was not in a position to accept membership in the Convention of Bern. The requirement that the copyrighted book must be manufactured in this country, coupled with the requirement for simultaneous publication, made conditions which were incompatible with the regulations accepted by the Bern association. This additional measure for securing American copyright for aliens (and, under reciprocity, foreign copyright for Americans), a measure which is the result of 53 years of effort on the part of individual workers and of successive copyright leagues, brings this country to the point reached by France in 1810 and by Great Britain and the states of Germany in 1836–37. Imperfect as the Act may be as judged by the present standards of international copyright legislation, it not only marks a great advance in the development of public and legislative opinion in the United States, but has resulted in substantial gains for the authors of America, for the authors of Great Britain, and for the American book-buying public.

The results of this Act have not proved wholly satisfactory. As far as it concerned authors whose books originated in a language other than English, the Act has produced no real benefit. The authors of France, Germany, and Italy—states which are in direct intellectual relations with the United States, and whose governments have accorded to American writers the same copyright protection as it secured for their own authors—secure copyright in form but not in fact. The difficulty of inducing American publishers to make investments in American editions of continental books is not obviated because of the fact that the American law does not place the publishers in a position to protect themselves against unauthorized competing editions. Since the copyright secured for a translation of a book not copyrighted in the United States in the original text would cover only the particular version, a piratical competitor might produce, in case the work should prove a success, another version, reaping the advantage of the literary judgment and of the advertising contributed by the original and authorized publisher. As a result, the production of American editions of continental works has, since the Act of 1891, been inconsiderable. Foreign authors secured but trifling returns from American publication from the simple fact that they secured very few readers, and American readers failed to obtain the advantage of a knowledge of current continental literature, the reading of which would have widened their general cultivation and have helped to lessen international prejudice. The law has thus deprived American publishers, and all who have a business interest with these publishers in the trade of book manufacturing, of the opportunity of making legitimate profit from the production of American editions of the works of continental authors. The law has also proved defective in the provisions relating to the protection of works of art, provisions which were framed some time in advance of the development of important methods of art production, and in its failure to extend the term of copyright with a view to securing for the producers of intellectual property the control of their productions during their own lifetime, and of preserving for their heirs the enjoyment of the results of these productions during a reasonable term after the death of the producer. The United States should not have been satisfied with according to literary producers a smaller term of protection than is considered advisable by any other civilized state excepting Greece.

The diverse theories in regard to literary property which, in the shaping of the copyright legislation of the world, have come into discussion may be briefly summarized as follows: First, property in an intellectual conception or creation is analogous to property in a material creation, and implies as comprehensive and unlimited a control for the production as that conceded by the community to other classes of productions; second, intellectual property depends upon an individual agreement or convention, to which each person enjoying the use of a copy of a literary or artistic production makes himself a party; third, property in an intellectual production depends upon the natural or personal rights of the author, who, through unauthorized appropriations, may suffer an injury or tort; fourth, property in an intellectual production is the creation of statute, and is subject to limits depending, not upon the natural rights of the producer, but upon the convenience or advantage of the community.

Of these several theories or conceptions, it is the fourth which represents in substance the survival of discussions of two centuries, and which has formed the basis of the copyright legislation of both Europe and America.

For further particulars as to the copyright legislation now in force in the United States and elsewhere, see Copyright and United States Copyright Act.

LITERATURE. See Criticism.

LITH'ARGE, formerly Lithargie; Lithargy. The yellow or red oxide of lead (PbO). It is formed by intensely igniting lead or lead compounds in the air. It melts at a red heat and is volatile at white heat. It may be formed by heating metallic lead, molten, in contact with the air for a long time. When the temperature is insufficient to melt the oxide, the latter is of a dull-yellow color, sometimes called massicot, but at melting temperature takes a brighter and redder color. In the compound the lead is bivalent. Cooling the molten oxide allows the formation of a mass of reddish-yellow, six-sided plates, semitransparent. It is sparingly soluble in water, has an alkaline reaction, and readily forms salts with acids. It may be reduced to metal by heating in hydrogen or carbon monoxide, or on heating in the inner blowpipe flame (reducing), or by heating with carbon. It dissolves in sugar solution. It is much used in assaying as a flux and as a gatherer for silver and gold. It is used in the composition of flint glass and in glazing earthenware. It is used also in the manufacture of varnishes and drying oils. See Lead.

LITHERLAND, lith'ẽr-land. A manufacturing town in Lancashire, England, 4½ miles north of Liverpool. Pop., 1901, 10,600; 1911, 14,795.

LITHIA EMERALD. See Hiddenite.

LITH'IC-ACID DIATH'ESIS (from Gk. λιθικός, *lithikos*, relating to stone, from λίθος, *lithos*, stone); Uric Acid Diathesis: Lithæmia; Lithuria. An excessive production of lithic (or uric) acid and its salts in the body, coincidently with which there is lessened alkalinity of the blood, rendering that fluid less able to hold the acid and its salts in solution. The latter thus become deposited in various tissues, particularly in the joints and the spleen. Sufferers from this condition are said to have the lithic-acid diathesis. Their urine is of a dark-golden color and is more acid, of higher specific gravity, and less abundant than the urine of health. It deposits urates on cooling, and it may contain albumen or traces of sugar. The output of uric acid is low at times, but the urine may be loaded with it at other times.

There is a motley group of symptoms (one writer has enumerated 39) indicative of the lithæmic state. Persons who have lived not wisely but too well, who have eaten and drunk largely, and persons who lead sedentary lives, may manifest it. Cases are seen in members of gouty families, who may never themselves have suffered from that disease. In such a family the daughters often escape, while one son may have lithæmic attacks of great severity, even though he may lead a temperate life and try in every way to avoid the conditions favoring the disorder. Cutaneous eruptions, such as eczema, are frequently associated with this diathesis; as are also disorders of the stomach and intestines, such as furred tongue, foul breath, and constipation. It may be accompanied by symptoms of a torpid liver. There may be a swelling of the parotid gland, simulating mumps.

Disorders of the circulatory system are frequently associated. The blood tension is persistently high, the walls of the blood vessels become stiff, and heart and kidney changes gradually develop, when dropsy may supervene. It is not unlikely that the lithæmic state may hasten the development of aneurism or apoplexy; for the nutritional disorder with which an excess of uric acid is associated induces in time increased tension in the blood vessels, hardening of the arteries, chronic kidney disease, and changes in the muscular tissue of the heart.

Among nervous manifestations headache is frequent. Neuralgias, particularly sciatica, are not uncommon. There may be hot or itching feet at night. This symptom is as old as Plutarch, who observed it and called it "the lisping of the gout." But, as a rule, the peripheral circulation is sluggish and the feet cold. Cramps in the legs and hot and itching eyeballs may be signs.

Chronic bronchitis is frequent in such cases, as are also certain affections of the eye, such as iritis, retinitis, and glaucoma.

The treatment is hygienic, dietetic, and medicinal. Treatment is begun by a system of hot baths, saline cathartics and diuretics, until all the eliminating channels are functionating normally. The lithæmic subject should live temperately, abstain from alcohol, and eat moderately. He should live in the open air, exercise vigorously, and keep regular hours. The skin should be kept active by cold baths with friction for the robust, and by warm evening baths for the debilitated. The dress should be warm, extremes of temperature should be avoided, and care should be taken not to have the skin suddenly chilled. The appetite should be kept within reasonable bounds, meals should be at stated intervals, and food should be well chewed and eaten slowly. In the matter of food, quantity is a factor of more importance than quality. Meats, tea, coffee, alcohol, especially malt liquors, and tobacco should be rigorously restricted. Each individual case should receive separate consideration from the physician. Nowhere, perhaps, is it more necessary than in lithæmia to consider the man as well as the ailment, and very often more the man than the ailment. This is especially so when we consider the possible sequelæ of this state. Among medicines, mild alkaline mineral waters, wine of colchicum, citrate of potash, sodium salicylate, iodide of potash, guaiacum, quinine, piperazin, and the bitter tonics are employed. For external application, warm fomentations, ichthyol, and steaming are appropriate. Whenever the blood becomes increasingly alkaline, some of the accumulated acid is washed out of the spleen and the joints, and, before it is eliminated from the system, attacks the nerve centres and the blood vessels. The result is headache and depression of spirits. Acids relieve the symptoms, but cause further accumulation in the joints and spleen, with later serious results. Consult: Alexander Haig, *Uric Acid as a Factor in the Causation of Disease* (London, 1908); Miles, *Muscle, Brain and Diet* (ib., 1900); Brunton, *Disorders of Assimilation, Digestion, etc.* (ib., 1901). See GOUT; RHEUMATISM.

LITH'IUM (Neo-Lat., from Gk. λίθος, stone). A metallic chemical element, whose oxide was discovered in 1817 by Arfvedson. The metal itself was first obtained by Brandes in 1822, and a quarter of a century later Bunsen and Matthiessen invented the process now used in making it. (See below.) Lithium is distributed in nature widely, but in very small quantities, the only minerals containing considerable amounts of it being the rare minerals spodumene, lepidolite, petalite, triphylene, and amblygonite. It is also found in certain mineral waters and in the leaves of certain plants. Finally, it occurs in meteorites, and its presence has been detected in the sun. In order to extract the lithium from a given mineral (say, lepidolite), the latter is fused, so as to render it capable of being decomposed by strong hydrochloric acid; the acid is caused to act on the mineral for several hours, nitric acid is added to the resulting solution, then the solution is diluted and neutralized with sodium carbonate. On filtering and concentrating, the solution is precipitated with an excess of sodium carbonate. The resulting lithium carbonate may then be transformed into other lithium compounds, among which the chloride may be used to obtain metallic lithium, by means of a strong voltaic current passed through the fused salt. In 1904, 577 short tons of lithium minerals, valued at $5155, were produced in the United States, and the importation of such minerals had practically ceased.

The element lithium (symbol, Li; atomic weight, 6.94) is the lightest metal known, its specific gravity being about 0.59. It is white, it can be pressed into wire, and it can be welded at ordinary temperatures. If exposed to the air, it soon becomes covered with a yellowish-white film of oxide. Like sodium and potassium, with which it is classed as one of the "alkali metals," it decomposes water with great readiness. It is, on the other hand, less volatile than sodium or potassium and does not distil at a red heat. Its melting point is 186° C. (about 367° F.). Again, like sodium and potassium, it dissolves in liquid ammonia, the solution having a blue color. With ammonia it also forms a brownish-red solid having the composition $LiNH_3$.

Lithium Compounds. Among these deserve mention the oxide, the carbonate, the citrate, and the salicylate. The *oxide*, Li_2O, may be prepared by heating the carbonate with charcoal; with water it forms the hydroxide, LiOH, which may, by crystallization from aqueous alcohol, be obtained as $LiOH + H_2O$; the hydroxide may also be prepared by the action of lime on lithium carbonate. The *carbonate* of lithium, Li_2CO_3, is a light, white powder, sparingly soluble in water, but insoluble in alcohol. The *citrate* of lithium, $Li_3C_6H_5O_7$, is a white powder readily soluble in water; it may be prepared by the action of citric acid on lithium carbonate; "effervescent lithium citrate" may be prepared by mixing sugar with citric acid, drying the mixture, and adding to it sufficient quantities of sodium bicarbonate and lithium carbonate. The *salicylate* of lithium, $LiC_7H_5O_3$, is a white powder readily soluble in water and in alcohol; it may be prepared by heating lithium carbonate with salicylic acid and water, until effervescence ceases. A number of lithium salts are used in gout, in uric-acid gravel, and calculus, owing to their capacity for causing sodium urate to dissolve in water. The carbonate, in the form of a lotion, is used to alleviate the pain of gouty inflammation and to heal gouty ulcers. The presence of lithium compounds in a given substance can be readily recognized by introducing a small amount of the substance into a colorless flame (like that of the Bunsen burner), to which they impart a characteristic red coloration.

LITHOD'OMUS, LITHOPHAGUS. See MUSSEL.

LITHOFRACTEUR, lĭth'ō-frăk-tẽr'. See EXPLOSIVES.

LITH'OGEN'ESIS. The branch of geologic science which deals with the origin of rocks. As to the nature of the rock masses which constituted the crust of the earth upon its primary cooling, little is known, nor is it certain that they are represented in any of the formations of the present day. From a study of the rock-forming processes now going on, and of the character of those masses that are exposed at the earth's surface, geologists have grouped all rocks upon a genetic basis, into three great classes or divisions. 1. The metamorphic rocks include those that have been profoundly changed from their original condition. The oldest rocks of which we have knowledge—the gneisses and crystalline schists—are members of this class; they are characterized by a banded or foliated structure and may have originated from either sedimentary or igneous rocks by the effects of heat and pressure. 2. The igneous rocks comprise those which have cooled from a molten condition, such as lavas and granites. They have a massive structure and a glassy or crystalline texture. 3. The sedimentary rocks include those which have been derived from the igneous or metamorphic rocks by disintegration and decay, and which have been laid down on water or land. The water-deposited or aqueous rocks are the most important of this class; they are largely composed of fragmentary materials arranged into layers or strata and hence are known also as sedimentary rocks. See AQUEOUS ROCKS; ROCK.

LITH'OGRAPH'IC STONE (from Gk. λίθος, *lithos*, stone + γράφειν, *graphein*, to write). An even-grained, compact limestone, generally of a gray, drab, or yellowish color, that finds extensive use in lithography.

LITHOG'RAPHY. Properly speaking, the art of writing, drawing, or engraving on stone of a particular kind, or on metals endowed with similar qualities; in a more general sense, the art of chemical or surface printing from stone or metal, by means of which drawings or writing traced with fatty ink are multiplied, in contradistinction to letterpress or relief, and copperplate or intaglio printing.

This art or process is based purely upon the principle of chemical affinity of fatty or resinous matter for substances of the same nature and their repugnance for water. The stone or metal used is, by reason of its porosity, capable of receiving and retaining water to the evaporating point, as well as fatty or resinous matter, to such an extent that to remove it mechanical means or powerful chemical agents are necessary.

Processes and Materials. When a drawing is made on stone or metal with either lithographic crayon or ink, and all other parts of the surface are moistened with water, both the fatty substance and the moisture will penetrate the porous surface. A roller covered with fatty or resinous printing ink passed over this stone or metal will cause the ink to adhere to the fatty or resinous parts constituting the design and will be repelled by the moist parts; in consequence, the former only will appear in an impression.

The stone used in lithography is a variety of calcium carbonate of porous texture, known as "lithographic stone." The best variety is found at Solenhofen, Bavaria, and almost the entire industry receives its supply from that source. Stone of an inferior quality is quarried in England, France, Italy, Prussia, and Russia, and in later years in Canada and some of the Western States. Lithographic stone varies in color from a blue gray to a yellowish gray, the best quality being found among the light-gray and sometimes among the dark-yellow varieties. The dark-blue-gray or French stone is very fine in texture, but its color does not contrast sufficiently with that of the design to enable the artist or transferer to judge his work as well as on the light-gray stone. It is sawn at the quarries into slabs from 3 to 4 inches in thickness, varying in size from 6 × 8 inches to 44 × 64 inches, and sold at prices ranging from 1½ cents to 30 cents per pound, according to size and quality. The larger sizes are extremely scarce when without flaws, such as open veins, streaks of glass, or soft lime spots.

It is partly due to this fact, and partly to the greater expense attached to the handling of stone, that almost since the invention of lithography a substitute has been sought for it. Zinc has been used during the last 70 years or more, in its natural state as well as, later on, with a coating embodying the components of the lithographic stone, under the name of "calcsinter" plates. The use of zinc plates as a substitute for stone is, however, confined to the more ordinary grades of work, owing to the inferior and uncertain results obtained. About 1890 John Mullaly experimented with aluminium as a substitute for lithographic stone. His experiments were finally crowned with success, but it was some time before lithographers could be persuaded to make use of it. In the year 1894 Dr. Otto Strecker, of Mainz, Germany, invented a method now called the "Strecker process," for treating aluminium plates with a coating of aluminium salt. This method has come into very general use in Germany, and similar processes are now very considerably used in England, Germany, France, Russia, the United States, and other countries.

Aluminium plates are said to have advantages over stone as to quality of work and, apart from that, to offer all the advantages resulting from their uniform quality, their economy, flexibility, exemption from breaking, and ease of handling and storage. Designs can be removed from either stones or plates by chemical or mechanical means, and their surfaces prepared for the reception of new designs about 200 times in the case of a stone 4 inches thick and of an aluminium plate $\frac{28}{1000}$ of an inch thick. Lithographic crayon is composed of beeswax, shellac, tallow, mastic, turpentine, soap, and lampblack. Lithographic "tusche," or ink, which is used for drawing with the pen, contains the same ingredients, with the grease a trifle more predominant, in a liquid state.

When a drawing, which necessarily is made reversed, is completed on stone, its surface is bathed with a solution of acid and gum arabic. The object of this treatment, called "etching," is to prepare the surface of the stone having no design for the better retention of water; to clear the surface from any imperceptible fatty particles arising from contact with fingers, etc.; and, finally, to render the drawing insoluble in water, by decomposing the alkali contained in the soap which is one of the bases of its composition. After etching, the stone is thoroughly washed, first with water, then with turpentine, which removes every visible trace of the drawing, leaving only the fatty substance of the crayon or ink on the surface. After being repeatedly moistened and rolled in with printing ink it is ready for printing.

Of the various processes employed in drawing on stone, the crayon process is without question the most important. For this purpose the stone is grained. This is done with sand and water between two slabs of stone, which are rubbed together with a circular motion until the lower one has the grain desired—either fine or coarse, according to the nature of the work to be performed. Next in importance is the pen-stipple process. For this purpose the stone is polished with pumice. Stippling consists of drawing with small dots, the values in shading being obtained by the relative density of these dots.

A mode of procedure which differs widely from both crayon and pen-stipple manner is engraving, though based on the same principle. In this case the stone is finely polished and etched and then covered with a dark ground—lampblack and gum arabic dissolved in water. The drawing or writing is scraped into the ground with an engraving needle or a scraper, laying bare the surface of the stone. When the design is finished, the stone is covered with linseed oil, the ground washed off, the surface moistened, and printing ink is applied by means of a dauber, which then adheres only to the lines of the design, by reason of the oil they contain.

Chromolithography. In this either the crayon process, the pen stipple, or a combination of both, is employed. The important feature of this branch of lithography is to obtain a perfect register of the colors to be superposed. To accomplish this, for higher-class color work, a key is made by tracing with an engraving needle on gelatin a complete outline of the original, following even the most minute patches of color. The lines thus engraved on gelatin are filled in with lithographic ink and transmitted to stone by pressure in a hand press. Register marks of thin crossed lines are then added in the margin of top, bottom, and sides, which become the guides for accurate register in printing. The design is then "etched" and rolled up with printing ink, and impressions to the number of colors required are made therefrom. These so-called "offset" or "key" impressions are in turn transmitted to stone by pressure, having first been powdered with a finely ground dry color, which, owing to its fatty qualities, adheres only to the line work. Where a drawing stone is used in place of the key, offset impressions of the same, supplied with the register marks, accomplish the same purpose. The number of colors used varies according to the quality of the work desired. For commercial purposes the number ranges from 3 to 15, and in some cases, where especial results are desired, as many as 20 and 30 colors are used. For monochrome four tints are usually employed—one for the main drawing, a light ground tint, a medium tint for modeling, and finally a dark tint for accents.

Photolithography. In later years photography has been made a valuable adjunct to lithography. One of its applications is photolithography, by means of which pen drawings are faithfully reproduced at comparatively small expense. Another result is the application of the half-tone or Meisenbach process to lithography, for monochromes, and chromolithographs, in which case a photographic reproduction from the original on stone forms the basis for the several color plates, taking the place of the key, subject to the manipulation of the expert chromolithographer.

Of the several methods in use to achieve a photographic reproduction on stone, the oldest one, invented by Niepce in 1833, is based on the property of asphaltum dissolved in oil of lavender to become insoluble when exposed to actinic action. Thus, when a half-tone negative is superimposed upon a stone coated with an asphalt solution, in perfect contact, and exposed to the sun's rays, the asphalt solution will only be affected by such light as can pass through the negative. Dissolving the parts not affected in this manner, by means of turpentine, will produce a positive on stone, which, having in its composition the necessary ingredient, grease, is prepared for printing purposes in very much the same manner as drawing on stone.

The method most generally employed, however, is the albumen process. Albumen in solution with bichromate of potassium has the same properties as the asphaltum solution. It is more sensitive to the chemical action of light, achieving the results desired in a much shorter space of time. After exposure the stone is immediately covered with printing ink to prevent further action. The parts that remain soluble are washed away with water, the ink adhering only to the parts that have become insoluble, thus creating the conditions which are essential for lithographic purposes.

The three-color process is also applied to some extent in lithography, reproducing on stone the three negatives necessary for this process by either of the methods described. Another photolithographic process, which, though still in its experimental stage, deserves mention, is the grain process. The object in view is to substitute, for the geometrical pattern characteristic of half-tone work, a somewhat irregular grain finish which more closely resembles the results of a crayon drawing on stone. Some very fair results have been achieved in this direction.

Transfer Process. The rapid development of the lithographic industry led to the universal adoption of the transfer process, by which the same design can be reproduced as many times at one impression as the size of the sheet to be printed will admit. Impressions from the original stone are made with transfer ink (containing practically the same ingredients as lithographic ink) on paper coated with a sizing of starch and glycerine. The impressions are then laid in their proper position on a sheet of paper and fixed by indentations made with the dulled point of an engraving needle. This sheet is then laid down on a clean polished stone or metal plate and repeatedly pulled through a hand press until all the ink has been transferred from the impressions to the stone or metal plate, the paper being frequently moistened during this process until it can readily be removed. A weak solution of gum and water is applied, the stone is then rolled up with printing ink, and the transfer is finally "etched" in the same manner as an original drawing to make it ready for printing. In chromolithography the first transfer made is that of the key plate containing the register marks. An impression from this transfer, coated with shellac to insure against stretching or shrinking, is mounted on a sheet of zinc or aluminium, and the impressions of all succeeding transfers are "stuck up" or indented on this key sheet, so that all the colors will be in accurate register with each other.

Lithographic Printing. Machinery used for lithographic printing may be divided into two classes, hand presses and power presses. The construction of the lithographic power press varies but slightly from that of the typographic power press. It is operated on the same general principle, except that it has in place of the letterpress form a lithographic stone in its bed, and is supplied with mechanism for applying the moisture to the stone. When the hand press is used, the moistening is done by means of a sponge.

The hand press consists of (1) a movable bed for the stone, resting and traveling on rollers; (2) an impression bar or scraper of boxwood, with a wedge-formed edge, running lengthwise, covered with leather and fitted to a yoke; and (3) a tympan hinged to that end of the bed nearest the impression bar. After the stone has been moistened and rolled up with ink, the paper upon which the impression is to be made is laid upon the stone in the desired position and a backing sheet placed over it; the tympan is lowered to cover the entire stone and bed, the edge of which is then brought forward under the impression bar; the pressure is applied by means of a hand lever at the side of the press, and the entire length of the bed passed under the impression bar. The pressure is then released and the bed brought back to its original position, the tympan raised, and the sheet, having taken the impression, is taken off. This method of hand printing, which before the introduction of the power press was used exclusively for lithographic printing, is now only used for the purpose of making artist proofs and transfers for printing on power presses.

The substitution of the flexible aluminium plate for lithographic stone has resulted in the successful use of rotary printing machinery and has opened the field of multicolor printing by the lithographic process. For this purpose rotary presses are used which print two or more colors in rapid succession before delivering the sheet. The rotary lithographic press consists of two cylinders—one to hold the plate and the other to furnish the pressure. It is supplied with a mechanism similar to that of the flat-bed lithographic press, for distribution and application of moisture and ink. Its speed is about 50 per cent greater than that of the stone or flat-bed press. Rotary presses having two or more plate cylinders and printing two or more colors each time a sheet is fed are already largely in use, and five-color and six-color presses are being made on the same principle.

Offset Lithography. This method of lithographic printing takes its name from the fact that the impression on the paper is taken from an intermediate rubber-covered cylinder in place of directly from the printing surface of stone or aluminium. "Offset" printing has long been used for lithographing on metal, but only recently has the method come into general use for lithographing on paper. The presses are constructed in much the same general way as the standard rotary press, except that the cylinders are smaller in diameter, and there is an additional cylinder covered with a rubber blanket. The inking and damping arrangements are the same on the offset press as on the rotary press.

The work to be reproduced is transferred in the usual manner to the aluminium or zinc plate, which is strapped to the printing cylinder, the same as on the ordinary rotary press. In place, however, of printing the design directly from the aluminium on to the paper, the impression is taken from the aluminium plate on to the rubber-covered cylinder. The paper is then fed through the press in contact with this rubber cylinder and receives the "offset" impression from the rubber cylinder. The rubber cylinder, presenting a slightly yielding printing surface, permits the lithographer to use many beautiful rough-finished and antique papers, which were heretofore unsuitable for lithographic color work and does away with the necessity for highly finished or coated papers for lithographic printing. Photography plays an important part in the operation of this process in the preparation of the original engravings, as it is possible to print delicate half tones, which are utilized as a part of many of the color plates in the finer work done by this method. The only necessary change from the regular method in the preparation of the engravings is that the originals must be placed on stone just as they appear when printed and not in reverse, as in regular lithography. Offset presses are run at a much higher speed than ordinary rotary or flat-bed presses.

HISTORY

Lithography was invented in 1798 by Aloys Senefelder (q.v.), a printer of music from copper plates at Munich. Experiments made while thus engaged led to his discovery of chemical or surface printing. It has been claimed by some that Simon Schmidt, who printed from stone as early as 1788, deserves credit for the invention of lithography; but, as a matter of fact, Schmidt merely substituted stone for metal in relief printing, which has nothing in common with lithography. In 1806 Senefelder established himself at Munich as a lithographic printer. Munich thus became the centre of the art; in 1809 there were no less than seven separate establishments, together with a number of private presses. Conspicuous among the first lithographers of Munich was Ferdinand Piloty, father of Karl Piloty, who in 1808 published together with Strixner a series of copies of old masters, and in 1815 reproductions of the pictures in the Munich Gallery. The inventor died in 1834, since which time there have been few improvements upon his methods, so thoroughly did he cover the field. From Munich the art rapidly spread throughout Europe. After several unsuccessful attempts it was established in Paris by Godfrey Engelmann, a native of Mülhausen (Alsace), in 1816. To him is due the credit of inventing chromolithography, for which the French government granted him letters patent in 1837. In 1816 Franz Hanfstängl visited Munich, and in 1834 he founded the first lithographic house in Berlin. Lemercier had meanwhile established himself in Paris and made great progress in the new art. Of especial importance was the lithograph series designed by Adolf Menzel (q.v.). The first lithographic house in London was established in 1822 by Hullmandel. In America lithography was introduced as early as 1828 by Barnett and Doolittle, in New York City. It remained for Paris, however, to develop lithography as a high art. The climax was reached during the reign of Louis Philippe, by such men as Daumier, Grandville, Travies, and Gavarni, famed for their satirical drawings; Deveria, Delacroix, Johannot, and Gigoux, the delineators of romantic literature; Charlet and Raffet, who glorified on stone the conquests of Napoleon; Géricault and Richard Park Bonington. James Duffield Harding and Alexandre Calame produced some noted landscapes, Eugène Isabey lithographed some very fine marines, and Julien's fame as a lithographic artist culminated in his famous "Etudes en Deux Crayons." With the introduction of the power press lithography soon developed into a world-wide industry. Its applications and accomplishments multiplied to such an extent, not only artistically but commercially, that to enumerate them would be impossible. The most noteworthy feature of its recent development is the modern extensive output of German lithography, practiced in all German art centres by such able exponents as Walther Georgi, Hans von Volkmann, and Otto Fikentscher.

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LITHOLAPAXY, lĭth′ṓ-lȧ-păk′sĭ *or* lī-thŏl′-ȧ-păk′sĭ. See Lithotrity.

LITHOL′OGY. See Petrology.

LITH′OMANCY (λίθος, *lithos*, a stone + μαντεία, *manteia*, divination). Divination by means of stones. See Superstition.

LITH′OMARGE (from Gk. λίθος, *lithos*, stone + Lat. *marga*, marl). A name given to the compact earthy varieties of halloysite, kaolinite, and pinite. They are essentially hydrated aluminium silicates, also containing iron oxide and other coloring substances, and are either white, light yellow, or red in color, according to the amount of impurity. These minerals are soft, greasy to the touch, and adhere strongly to the tongue. They are found in Germany, Russia, Cornwall, England, and at various localities in the United States.

LITH′ONTRIP′TICS (from Gk. λίθον, *lithon*, acc. sing. of λίθος, *lithos*, stone + τρίβειν, *tribein*, to rub, to wear out). An old term applied to remedies which, whether taken by the mouth or injected into the bladder, act as solvents for urinary calculus or stone. Those medicines which merely prevent their formation are designated antilithics.

Various medicines have at different times been recommended and employed. Different remedies are selected according to the chemical composition of the calculus. For uric acid calculi, distilled water, the salts of potassium, lithium, and magnesium, piperazin water, and lycetol are given; for phosphatic calculi, benzoic acid, ammonium benzoate, and dilute nitric acid are advised; while, in the case of calcium oxalate calculi, dilute nitrohydrochloric acid and lactic acid are believed to be most efficacious. Examination of the crystalline deposits in urine afford a clew to the character of the stone. Rather more than a century ago, limewater and soap, when swallowed in sufficient quantities, had a high reputation as solvents for urinary calculi. These were the only active ingredients in Miss Stephen's *Receipt for the Stone and Gravel*, which was reported on so favorably by a committee of professional men that the English Parliament, in 1739, purchased the secret for £5000. The treatment doubtless afforded relief; but there is no evidence that any calculus was actually dissolved, for in the bladder of each of the four persons whose cure was certified in the report the stone was found after death. At present no substance is known which, taken by the mouth, has the power of dissolving calculi. The relief which in many instances has followed the administration by the mouth of substances supposed to be lithontriptics has been derived, not from the solution of the calculi, but from the diminution of pain and irritation in the bladder.

LITH′OPHYTE (from Gk. λίθος, *lithos*, stone + φυτόν, *phyton*, plant). A plant that grows on rocks, sometimes underneath the water, as marine algæ. See Benthos; Rock Plants.

LITH′OPONE. See Barite.

LITH′OSPHERE. See Crust of the Earth; Geography.

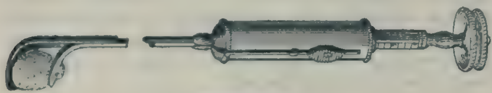
LITH′OSTRO′TION (Neo-Lat., from Lat. *lithostrotus*, mosaic, from Gk. λιθόστρωτος, paved with stone, from λίθος, *lithos*, stone + στρωτός, *strōtos*, covered, from στρωννύναι, *strōnnynai*, to spread). A characteristic coral fossil of the Carboniferous limestones, found in all parts of the world where those rocks are known. This coral, allied to *Cyathophyllum*, forms a rounded mass of more or less closely packed cylindrical or polygonal tubes, the upper ends of which have cells with numerous strong radiating septa and usually also a prominent central conical elevation or columella. About 15 species are known, of which the more common are *Lithostrotion canadense*, of the Mississippi Valley States, and *Lithostrotion junceum*, of Europe and Asia. See Coral.

LITHOT′OMY (Lat. *lithotomia*, from Gk. λιθοτομία, *lithotomy*, from λίθος, *lithos*, stone + τομή, *tomē*, a cutting, from τέμνειν, *temnein*, to cut). The technical name for the surgical operation popularly called *cutting for stone*.

As most of the symptoms of stone in the bladder (see Calculus) may be simulated by other diseases of the bladder and adjacent parts, it is necessary to have additional evidence regarding the true nature of the case before resorting to so serious an operation as lithotomy. This evidence is afforded by *sounding* the patient—a simple preliminary operation, which consists in introducing into the bladder, through the natural urinary passage (the urethra), a metallic instrument, by means of which the stone can be plainly felt and heard. From the shortness of the female urethra and the extent to which it can be dilated, and, additionally, from the comparative rarity of calculous affections in women, the operation of lithotomy is almost exclusively restricted to the male sex.

Lithotomy has been performed in various ways at different times. The earliest form of lithotomy is known as *cutting on the gripe*, or *Celsus's method*. It received the former name from the stone, after being fixed by the pressure of the fingers in the anus, being directly cut upon and extracted; and the latter from its having been first described, so far as is now known, by Celsus, although it had probably been practiced from time immemorial. At a later period this operation received from Marianus the name of the *apparatus minor* (from a knife and hook being the only instruments used), to distinguish it from his own method, which he called the *apparatus major*, from the numerous instruments he employed. The *Marian method* was founded on the erroneous idea that wounds of membranous parts would not heal, while their dilation was comparatively harmless. The object was to do as little as possible with the knife, and as much as possible with dilating instruments; and the necessary result was laceration and such other severe injury that this became one of the most fatal operations in surgery. Nevertheless, it was the operation mainly in vogue for nearly 200 years. At present surgeons, operating by cutting through the perineum (the body between the rectum and the bladder), use a median, or a lateral, or a slightly curved transverse incision, according to individual preference. But either of these methods is suitable only for the removal of a small stone; therefore it is most frequently advisable to remove the calculus by an abdominal incision (suprapubic lithotomy), which was first employed by Franco in 1561. By this method the opening is made first above the pubes, and the bladder is entered without cutting the peritoneum. Cutting operations for stone are not much practiced in modern surgery, the procedure known as lithotrity (q.v.), or crushing, being employed instead. In this method an ingenious instrument with powerful jaws is introduced through the urethra into the bladder, the stone seized and crushed into small fragments and washed out with water. When the stone is very large or encysted, or the urethra narrowed by undilatable stricture, lithotomy must be the operation of choice. For details of treatment, consult White and Martin, *Genito-Urinary Surgery and Venereal Diseases* (Philadelphia, 1906), and Walker, *Surgical Diseases and Injuries of the Genito Urinary Organs* (New York, 1914).

LITHOT′RITY (from Gk. λίθος, *lithos*, stone + Lat. *tritus*, p.p. of *terere*, to rub, to grind). The surgical operation of breaking up a stone in the bladder into such small fragments that they may readily be expelled through the urethra. Although the importance of such an operation has been recognized from the earliest times, a French surgeon, Civale, who commenced his researches in 1817, but did not perform his first operation till the beginning of 1824, is entitled to be regarded as the discoverer of lithotrity. The instrument by which the disintegration of the stone is effected is introduced in the same manner as a catheter or sound into the bladder, and, after catching the stone, crushes it to pieces, the stone being grasped by the blades of the instruments, one blade acting on the other by means of a screw. The small fragments are then washed out of the bladder by means of a special apparatus, called by Bigelow an evacuator. Great care must be taken that no fragment remains in the bladder, as it would surely form the nucleus of a new stone.



LITHOTRITE.

The process seems, at first sight, so safe, as compared with the operation of lithotomy, that it is necessary to distinguish those cases in which it may be resorted to and those in which it is contraindicated. It may be resorted to when the patient is an adult, and the urethra full-sized and healthy, so as freely to admit the passage of the instrument; it must be avoided in children, in consequence of the smallness of the urethra, and also when there is great irritation and thickening of the bladder; when there is great enlargement of the prostate, which hinders the manipulation of the instrument and the escape of the broken fragments of stone; when the stone is of large size, as, e.g., of a greater diameter than 2 inches; and when there is reason to believe that the concretion is a "mulberry" calculus which, from its extreme hardness, cannot readily be broken.

Litholapaxy is the term used to denote an operation by which the fragments of the stone are removed at the same time the stone is crushed. This procedure was made possible by the perfection of the instruments by Bigelow, of Boston, Mass., in 1878, Otis, of New York, having taught that instruments of large size can be introduced safely into the bladder. Consult White and Martin, *Genito-Urinary Surgery and Venereal Diseases* (Philadelphia, 1906), and Walker, *Surgical Diseases and Injuries of the Genito Urinary Organs* (New York, 1914).

LITHUANIA, lĭth′ū-ā′nĭ-ȧ (Lith. *Letuva*). A new state formed out of Russian territory after the European War. The limits were defined by a treaty with Russia, signed July 20, 1920, as follows: From the Duina River, west from Drujka, along the Drujka River and eastern shore of Lake Narocz and the Narocz River, and then through the railway junction of Molodecno along the Berezina and Niemen rivers to a point a short distance south of the city of Grodno. According to the claims of the Lithuanian government the country comprised all the former Russian Province of Kovno; all but two districts of the Province of Vilna; most of the Province of Suwalki; part of the Province of Grodno; and part of the Province of Courland. The northern frontier with Latvia nearly coincides with the former boundary between the old Russian provinces of Courland and Kovno. The estimated area is 60,000 miles and the estimated population 6,699,200. The capital is Vilna which had a population of 214,600. See SUPPLEMENT.

This region was formerly, and is still in great part, covered with forests and marshes, and the soil is very unproductive. The chief rivers are the Dnieper, Pripet, Berezina, Duina, Niemen, and Bug. The inhabitants are Lithuanians, Russians, Poles, and Jews. The early history of Lithuania is very obscure. Having no natural boundaries, it was anciently subject to constant invasions by its neighbors. But as the Lithuanians had no fortified towns to be captured, and as the woods and marshes were almost impassable, the country remained practically independent. The people were little advanced in civilization and had no central government until the latter part of the Middle Ages. They clung tenaciously to their pagan beliefs and practices, and it was only about the beginning of the fifteenth century that Christianity was established, the nation accepting the Roman Catholic faith. Early in the thirteenth century one of the chiefs, named Ryngold, whose personality is bound up with legend, is represented as having instituted a central government; the first clearly historic character, however, is Ryngold's son, Mendowg, who received recognition from Innocent IV in 1251 and reigned over Lithuania till about 1263. At this time the Teutonic Knights were establishing their power in the Baltic regions, spreading Christianity with fire and sword, and the bloody wars waged with them are a prominent feature in the early history of the Lithuanian principality. Fierce wars were also carried on against the Russians. Gedywin (1316–1341) wrested vast territories from Russia, including Volhynia and Vitebsk. In 1386 Jagiello, Grand Prince of Lithuania, married Jadviga, daughter of Louis the Great of Poland, and mounted the Polish throne, having been previously baptized. For 100 years from the time of Jagiello Lithuania and Poland had separate rulers, a loose political union existing between the two countries. From 1501 they had a common sovereign, and in 1569 the Diet of Lublin decreed the permanent union of Poland and Lithuania into one commonwealth, to be governed by an elective king. Henceforth the history of Lithuania is that of Poland. (See JAGELLONS; POLAND; RUSSIA.) Consult: Joachim Lelewel, *Histoire de la Lithuanie* (Paris, 1861); Theodor Schiemann, *Russland, Polen und Livland bis ins 17te Jahrhundert* (2 vols., Berlin, 1886–87); Zoladz, *Histoire de la Lithuanie* (Paris, 1902).

LITH'UA'NIAN LANGUAGE AND LITERATURE. The language and literature of about 2,000,000 Lithuanians, the great bulk of whom live in the Russian governments of Kovno, Vilna, Grodno, and Suwalki (the last in Poland). There are about 100,000 in the Prussian Province of East Prussia, and a number have emigrated to the United States. With the Lettic (q.v.) and Old Prussian (q.v.) the Lithuanian constitutes the Baltic subdivision of the Balto-Slavic group of the Indo-Germanic family of languages. The earliest Slavic literary records antedate the oldest Lithuanian records by seven centuries, yet the Lithuanian is more archaic than the Slavic in phonology, although in morphological structure it is less primitive. It has long, short, and half-long vowels, of which the Slavic, excepting the Servian and Czech, has no relics. The Lithuanian employs three accents: for short vowels, the grave; for long vowels, either the acute to mark a "falling" tone, e.g., *kó-tas*, 'steel,' or the circumflex to mark a compound "rising-falling" tone, e.g., *rã-tas*, 'wheel.' Like Sanskrit and Slavic, the Lithuanian accent is entirely free, often receding to the fifth syllable from the end, shifting from the root upon the affix and vice versa, e.g., *sukù*, 'I turn,' *súka*, 'he turns'; Skt. *dvēṣmi*, 'I hate,' *dviṣmás*, 'we hate,' *á-dvēṣam*, 'I hated'; Lith. *rankà*, 'hand,' gen. sing. *rañkos*.

Among the most notable phonological characteristics of the Lithuanian language are the retention of diphthongs: *véidas*, 'face, view,' Gk. *Ϝεῖδος*, Slav. *vidŭ;* Lith. *baisùs*, demon, Slav. *bēsŭ;* the retention of the primitive endings of nouns: Lith. *vĩlkas*, 'wolf,' Skt. *vṛkás*, Slav. *vlŭkŭ;* the complete loss of *h*, and the change of the aspirates to tenues: the German words *Christus, Franzose* are *Kristùs, Prancūzas* in Lithuanian. As in Slavic and Indo-Iranian, Indo-Germanic *k* became a sibilant: Indo-Ger. **km̊tó-m*, hundred, Lith. *szim̃tas*, Skt. *śatám*, Av. *satəm*, Slav. *sŭto*, Gk. *ἑκατόν*, Lat. *centum*.

In morphology, the Lithuanian has generally preserved the terminations remarkably intact. It has seven of the eight Indo-Germanic cases, and the three numbers; the neuter gender appears in pronouns only. There is no trace of the article, though, as in Old Church Slavic and Russian, the postpositive use of *ya* changes an adjective from the indefinite to the definite form. The verb makes the third singular do duty for the third person of all three numbers; it possesses four tenses: present, preterite, future (formed by the addition of *-siu*, Indo-Ger. *oso*, Skt. *-sya*, Gk. *σ*, e.g., Lith. *dusiu*, Skt. *dāsyāmi*, Gk. *δώσω*, I shall give), and imperfect; there are distinct forms for the indicative, optative, imperative, infinitive, and participle. The passive is periphrastic throughout, but the active construction is substituted whenever possible. A reflexive voice also is formed by the addition of *-s* (earlier *-si*, reflexive pronoun) to the active forms.

In its vocabulary the Lithuanian has drawn to a considerable extent from the German, Russian, and Polish. Its numerous dialects fall into two groups: the High (Southern) Lithuanian, which changes the combinations *ty* and *dy* to *cz*, *dz*, and the Low (Northern) Lithuanian, which retains *ty* and *dy*.

The earliest printed literary remains in Lithuanian are a translation of Luther's smaller Catechism (Königsberg, 1547); a baptismal formulary (dating from 1559); another translation of Luther's Catechism and the Gospels (1579), and the prayer books and translation of the Bible by the preacher Jan Bretkun (1535–1602). On it was based the excellent *Psalter* of Rhesa (1629). The earliest Catholic Lithuanian book was a translation by Michael Dauksza of a Polish Catechism (1595). It is a remarkable fact that in another work, published in 1599, Dauksza claims for the Lithuanian literary equality with Polish, Latin, and Greek. By 1701, 59 books had been printed in Lithuanian, but most of them were destroyed by unknown hands. To the Calvinist propaganda the Lithuanian owes its development for literary purposes, and the publication of a Calvinist New Testament (1701) marks the new period, when works of other than liturgical purport began to appear. The most important name during this period is that of the poet Christian Donalitius (1714–80). His pastoral epic, *The Four Seasons*, in hexameters, displays uncommon powers of observation and a facile style. This poem and six extant fables were published by Schleicher (St. Petersburg, 1865) and Nesselmann (Königsberg, 1869), with translation, notes, and glossary. Another important work was Philipp Ruhig's *Lithuanian Dictionary* (1749), later reëdited by Milke, with a preface by the philosopher Kant. The publications until the last quarter of the nineteenth century were mainly religious, although between 1801 and 1891 some 1200 different books were printed. The distinguished lexicographer Kurschat (1806–84) revised the Lithuanian New Testament and edited from 1849 to 1880 the weekly *Keleiwis* ("Traveler"). Simon Dowkont (1793–1864) collected important folklore materials. In 1861 Olechnowicz published fables and stories from Lithuanian life, and later the Bishop Baranowski (died 1902) wrote an epic, the *Onikshta Grove*. Fritz Kelch (1801–77) issued the first Prussian-Lithuanian newspaper, and in 1883 *Auszra* (*Dawn*), the first magazine, the organ of the Young Lithuanian party, was founded by Basanowicz. From 1834 to 1895 some 34 periodicals appeared in the United States.

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LITHUANIANS. A branch of the Letto-Lithuanian group of the Aryan family, living mainly in European Russia, between the White Russians and the Baltic and also in the United States; height, 1.643 meters in Lithuania and 1.639 meters in Poland. Their number is estimated at some 2,000,000. They are well made, blond, and with oval face, long, thin nose, thin lips, blue eyes, white skin, and light hair. They are said to exhibit elements of sub-Northern and Eastern race. They are largely husbandmen, wagoners, and woodmen. The Russian census of 1897 put the total number of Lithuanians and Letts at 3,094,069.

LITHUANIAN VERSION. See Bible.

LITHU'RIA. See Lithic-Acid Diathesis.

LITITZ, lit'its. A borough in Lancaster Co., Pa., 27 miles southwest of Reading, on the Philadelphia and Reading Railroad (Map: Pennsylvania, J 7). It is a popular summer resort, its attractions including the famous Lititz Springs, and has Linden Hall Seminary, established by the Moravians in 1794. Among its industrial establishments are knitting mills, chocolate and cocoa works, planing mills, and manufactories of cigars, animal traps, shoes, box board and paper, liquor, and pretzels. Pop., 1900, 1637; 1910, 2082. Lititz, founded by Moravians (q.v.) in 1757, was named after a village in Bohemia whence some of the forefathers of the Unitas Fratrum had emigrated, and was organized from Warwick township. The Brothers' house, built in 1759, was used as a hospital during part of the Revolutionary War, and a number of soldiers died and were buried here. Consult: *Moravian Historical Society Transactions*, vol. ii (Bethlehem, Pa.), and Mombert, *An Authentic History of Lancaster County, Pa.* (Lancaster, 1869).

LIT'MUS (corruption of *lacmus*, from *lac*, from Pers. *lak*, lac, from Skt. *lākṣā*, lac insect, from *lakṣa*, hundred thousand; so called from the great numbers of the insect in a single nest). A coloring matter of vegetable origin. Acids turn blue litmus red; alkaline solutions, on the contrary, turn red litmus blue. In laboratories litmus is used either in the form of a solution, or in the form of test paper impregnated with it. Litmus is manufactured principally in Holland, from *Lecanora tartarea* and other lichens. The process employed is similar to that used in the manufacture of archil (q.v.); the lichens are ground into a pulp with water, and potassium carbonate and ammonia are added. Under the action of these substances and of atmospheric air, the mass gradually assumes a blue color, owing to the formation of the coloring principles of litmus. Chalk or gypsum is then added, to render the mass thick enough to be formed into rectangular cakes, which are dried and brought into the market. The chemistry of litmus is but little known; the following, however, have been shown to be its chief coloring principles, viz., azolitmin, whose brownish-red color is turned blue by ammonia; purplish-red erythrolein, which, by the action of alkalies, is turned purple; and erythrolitmin, whose red color is changed by alkalies to blue. These coloring substances exist in commercial litmus in the form of lakes, i.e., combined with metallic hydroxides.

LIT'OLFF, Henry (1818–91). A European pianist and composer. He was born in London, studied the piano under Moscheles for several years, and in 1832 made his professional début in London. He went to France and then wandered around Europe giving concerts until 1851, when he settled in Brunswick and married the widow of the music publisher Meyer, of whose business he took charge. In 1860 he transferred the business to his adopted son Theodor, who in the following year started the cheap edition of classical music called Collection Litolff. As a pianist, Litolff was brilliant, passionate, but uneven. His compositions were melodious and his piano pieces (for example "Spinnlied") were popular. Of his other works the most noteworthy are: the symphony concertos Nos. 3, 4, and 5; the oratorio *Ruth et Boaz* (1869); a funeral march for Meyerbeer; the operas *Die Braut vom Kynast* (1847) and *Les Templiers* (1886); and the operetta *Héloïse et Abélard*. He died in Paris.

LIT'TA, Pompeo, Count (1781–1852). An Italian historian. In 1804 he entered the French army and participated in the campaigns in Germany. In the Italian revolutionary epoch of 1848 he was for a short time Secretary of War for the Provisional Government of Milan. He was the author of the comprehensive work entitled *Famiglie celebri d' Italia* (1819–38), embracing 53 histories, to which more have been added by Odorici, Passerini, and others.

LITTELL', Eliakim (1797–1870). An American editor and publisher, born in Burlington, N. J. He began in 1819 to edit and publish in Philadelphia the *National Recorder*, which, changed in 1821 to the *Saturday Magazine*, first published in America De Quincey's *Confessions of an English Opium-Eater*. In 1822 he established the *Museum of Foreign Literature, Science, and Art*, and in 1844 founded in Boston *Littell's Living Age*, later known simply as the *Living Age*.

LITTER. See Hospital.

LIT'TLE, Arthur Dehon (1863–). An American chemical engineer. Born in Boston, he studied at Massachusetts Institute of Technology in 1881–84; was chemist and superintendent of a paper mill at Providence, R. I., in 1884–85; and served as State assayer in Massachusetts in 1887–95. After 1886 he was a consulting chemist in Boston; became president of the chemical engineering company of Arthur D. Little, Inc., of the Chemical Products Company, and of the Fibre Finishing Company; and he lectured at Harvard University and Massachusetts Institute of Technology. In 1912–13 he was president of the American Chemical Society. He is author of *The Durability of Paper* (1903); *The Basis of Quality in Paper* (1910); *Earning Power of Chemistry* (1911); *Industrial Research in America* (1914).

LITTLE, Charles Coffin (1799–1869). An American publisher, born at Kennebunk, Me. In 1837 he founded the firm of Charles C. Little & Co., later Little, Brown & Co.

LITTLE, Charles Joseph (1840–1911). An American Methodist Episcopal clergyman and educator, born in Philadelphia. He graduated from the University of Pennsylvania in 1861 and studied in Europe from 1869 to 1872, part of the time under the noted scientist Helmholtz. He received the degree of Ph.D. from De Pauw University in 1882. He joined the Philadelphia conference of his church in 1862, subsequently being transferred to the Northern New York conference and finally to the Rock River conference. He was professor of mathematics in Dickinson Seminary (1867–68); of philosophy and history in Dickinson College (1874–85); of logic and history in Syracuse University (1885–91); and of Church history in Garrett Biblical Institute (1891–1911). Of this institute he was president from 1895 until his death. He was a delegate to the Methodist Centennial Conference held at Baltimore in 1884, and a delegate to a number of general conferences. In 1900 he delivered the Fernley lecture on "Christianity and the Nineteenth Century" before the British Wesleyan Conference. A linguist of ability and distinguished as a scholar, he wrote: *The Angel in the Flame* (1904); "The Religious Revival in History" in *The Revival, a Symposium*, edited by J. H. MacDonald (1905); "The Social Activities of John Wesley" in *The Social Ministry*, edited by Harry F. Ward (1910). Consult C. M. Stuart (ed.), *In Memoriam, Charles Joseph Little* (Chicago, 1912), which contains eight of his papers.

LITTLE, Thomas. The nom de plume of Thomas Moore.

LITTLE, William John Knox. See Knox-Little.

LITTLE BEAR. The constellation Ursa Minor.

LITTLE BECSKEREK. See Becskerek.

LITTLE BELT. See Belt.

LITTLEBOROUGH, lĭt′t'l-bŭr-ō. A manufacturing town of Lancashire, England, 3 miles northeast of Rochdale. Pop., 1901, 11,160; 1911, 11,697.

LITTLE BRITAIN. A small neighborhood in the centre of London, during the time of the Stuarts a famous quarter for booksellers. Its name was derived from the former residence there of the dukes of Brittany.

LITTLE CAUCASUS. See Caucasus.

LITTLE CAYMAN. See Caymans.

LITTLE CHIEF HARE. A book name, derived from the Indians, for the pika of the Rocky Mountains. See Pika.

LITTLE COLORADO, or COLORADO CHIQUITO. One of the principal tributaries of the Colorado River. It rises on the slopes of the White Mountains in the southern part of Apache Co., Ariz., and flows northwestward across the Painted Desert, joining the Colorado proper at an altitude of 2625 feet above the sea (Map: Arizona, D 2). Its drainage basin has an area of about 6000 miles, and its principal tributary is the Rio Puerco, which joins the main stream 2 miles above Holbrook. For the last 27 miles of its course it has cut into the plateau a cañon over 1800 feet deep.

LITTLE CORPORAL. An affectionate nickname given to Napoleon Bonaparte after the battle of Lodi on account of his youthfulness and small size.

LITTLE CROW (1810–63). A Sioux Indian chief. In 1851 the Sioux or Dakota Indians ceded most of their lands in the present State of Minnesota to the national government and removed farther north to lands which proved unsatisfactory. Though Little Crow had been influential in bringing about the transfer, he took advantage of every opportunity to create dissatisfaction. Some young men of the tribe murdered some settlers in 1862, and Little Crow urged a general massacre, claiming that the South would win in the Civil War then being waged, and that the government could not punish them. On Aug. 18, 1862, the whites at two agencies were massacred, and it is estimated that 1000 settlers were killed. Ex-Governor Sibley was appointed to the command of a military expedition and completely defeated the Indians at Wood Lake. Two thousand Indians and many whites held as prisoners were taken, and 303 Sioux were condemned to death by a military court; but President Lincoln intervened, and only 38 were executed. Little Crow fled, but was shot by a settler the next year. Much information on this raid may be found in *Collections of the Minnesota Historical Society*, vol. vii (St. Paul, 1887–94).

LIT′TLEDALE, Richard Frederick (1833–90). A controversial Anglican writer. He was born in Dublin, graduated at Trinity College, Dublin, 1854, and was ordained a minister of the Church of England, 1856. After a few years of parochial service in London, where he interested himself in charities, he resigned his charge in 1862 and devoted himself to authorship, making a special study of liturgies and of the relations between the national church and dissenting bodies. He was author of many works, including *Catholic Ritual in the Church of England, Scriptural, Reasonable, and Lawful* (1865); *Church Reform* (1870); *Plain Reasons against Joining the Church of Rome* (1880). He also contributed much to periodicals and was editor of the *Church Times*.

LITTLE DORRIT. A novel by Charles Dickens, which appeared serially from 1855 to 1857, and the nickname of its heroine, Amy Dorrit. See Dorrit, Amy.

LITTLE ENGLAND. A name given to Barbados.

LITTLE FALLS. A city and the county seat of Morrison Co., Minn., 98 miles by rail northwest of Minneapolis, on the Mississippi River and on the Northern Pacific Railroad (Map: Minnesota, C 5). It has a city library and two fine hospitals and a courthouse. Little Falls is the commercial centre for a productive agricultural and lumbering district and manufactures lumber, paper, flour, beer, agricultural implements, and bricks. The dam across the river here furnishes extensive water power. First settled in 1849, Little Falls was incorporated in 1889. The government is vested in an annually elected mayor and a municipal council. Pop., 1900, 5774; 1910, 6078.

LITTLE FALLS. A city in Herkimer Co., N. Y., 21 miles by rail east by south of Utica, on the Mohawk River, the Erie Canal, and the New York Central and Hudson River Railroad (Map: New York, F 4). It has a picturesque location on the slope of a narrow and rocky defile, flowing through which the river falls 45 feet in less than a mile, forming a number of cascades—the origin of the city's name. Good water power has contributed to the development of the city as a manufacturing centre; its products include knit goods, knitting machinery, paper, leather, dairy machinery, felt shoes, bicycles, incubators, mattresses, bookcases, etc. The city has a public library and a city hospital. There are municipal water works. A small settlement here was destroyed by the Indians and Tories in June, 1782, and the place was not resettled until 1790. Little Falls was incorporated as a village in 1811, reincorporated in 1827, and in 1895 was chartered as a city. On the outskirts is the grave of General Herkimer, of Revolutionary fame, with a monument erected in 1896. Pop., 1900, 10,381; 1910, 12,273; 1914 (U. S. est.), 13,077; 1920, 13,029.

LITTLE FERRY. A borough in Bergen Co.,

N. J., adjoining Hackensack, situated on the Hackensack River and on the New York, Susquehanna, and Western, the New York, Ontario, and Western, and the West Shore railroads. The chief industries are the manufacture of bricks and pearl buttons and the raising of garden truck for New York markets. Pop., 1900, 1240; 1910, 2541.

LITTLE GENTLEMAN IN VELVET. The name under which, in the reign of Queen Anne, toasts were frequently drunk by the Jacobites to the mole which was the ultimate cause of the death of William III. The King's horse stumbled against a molehill, throwing his rider, whose injuries brought on the illness of which he died in 1702.

LITTLE GIANT. A nickname applied to Stephen A. Douglas, referring to his great intellect combined with small size.

LITTLE ILIAD. See Lesches.

LITTLE INAGUA. See Inagua.

LITTLE JOHN. A companion of Robin Hood, the lieutenant of the band of outlaws. His real name is said to have been John Nailor. He was exceedingly powerful and was the only member of the band who could vie with the chief in shooting.

LIT'TLEJOHN, Abram Newkirk (1824–1901). An American Protestant Episcopal bishop. He was born at Florida, N. Y., graduated at Union College in 1845, and was rector of Christ Church, Springfield, Mass. (1850), of St. Paul's Church, New Haven (1851–60), and of the church of the Holy Trinity, Brooklyn, N. Y. (1860–69). While at New Haven, he also served as lecturer on pastoral theology in Berkeley Divinity School at Middletown. The diocese of Long Island having been constituted in 1868, Dr. Littlejohn was elected its bishop and was consecrated in 1869. Appointed in 1874 to take charge of the American Episcopal churches in Europe, he consecrated the church of St. Paul's Within the Walls, Rome, and opened the American Church in Paris. Besides sermons, charges, contributions to periodicals, etc., he published *Individualism: Discourses before the University of Cambridge, England* (1880), and *The Christian Ministry at the Close of the Nineteenth Century* (1884), lectures before the General Theological Seminary, New York.

LITTLE KANAWHA (kȧ-ną'wȧ) **RIVER.** A river of West Virginia, which rises in Upshur County and flows in a northwesterly direction into the Ohio at Parkersburg (Map: West Virginia, C 3). Its length is little over 100 miles. It is of some importance as an outlet for the products of the lumber and oil regions through which it flows. Slack-water navigation for 40 miles to Burning Springs has been procured by means of locks and dams.

LITTLE LAKE INDIANS. See Pomo.

LITTLE LORD FAUNT'LEROY. A popular child's story by Frances H. Burnett, originally published in *St. Nicholas* (1885).

LITTLE MAC. A nickname given by his soldiers to Gen. George B. McClellan.

LITTLE MAGICIAN. A nickname of President Martin Van Buren, given because of his skill in politics.

LITTLE NAMAQUALAND. See Namaqualand, Little.

LITTLE NELL. In Dickens's *Old Curiosity Shop*, a child who preserves the beautiful purity of her character in spite of her surroundings. See Old Curiosity Shop.

LITTLE PHIL. A nickname given by his soldiers to Gen. Philip H. Sheridan.

LITTLE RED RIDING-HOOD. A well-known fairy tale. Though a very old story, it appears for the first time in its present form in Charles Perrault's *Contes du temps passé*, published in 1697, as "Le petit chaperon rouge." Perrault wrote the tales from a nurse's story, it is said; but they became known in France through Straparola's tales in *Piacevoli notti*, published in 1550, and Basile's *Pentamerone* of 1637.

LITTLE ROCK. The largest city of Arkansas, State capital, and the county seat of Pulaski County, on the Arkansas River, 128 miles west-southwest of Memphis, Tenn., on the Rock Island, the St. Louis Southwestern, and the St. Louis, Iron Mountain, and Southern railroads (Map: Arkansas, C 3). It is built on a rocky bluff, 50 feet above the river, which is here spanned by three railroad bridges and a county bridge. The streets are regular and finely shaded. Little Rock is the seat of Philander Smith College (Methodist Episcopal), the Arkansas Baptist College (colored), Shorter College (colored), and of the medical and law departments of the University of Arkansas. It has, besides the State Capitol, a United States courthouse, Fort Logan H. Roots, the State penitentiary, State School for the Blind, the Arkansas Hospital for Nervous Diseases, the State Reform School, and the State Deaf-Mute Institute, Children's Home, Old Ladies' Home, City Hospital, Pulaski County Hospital, and St. Vincent's Infirmary. There are the Supreme Court, the State, Carnegie, and collegiate libraries, and a United States Weather Bureau station. The system of public parks includes about 400 acres, the most attractive parks being City and West End. Little Rock has large wholesale interests and an important trade, by river and rail, in cotton, lumber, bauxite ore, agricultural produce, and in its own manufactured products. The more important industrial enterprises include cotton gins and presses, with an extensive output of cottonseed oil and cake; foundries and machine shops, bauxite crushing plants, ice factories, railroad shops, planing mills, granite quarries, cotton, twine, furniture, and stave factories, flouring mills, brick and tile works, etc.

The government is vested in a mayor, elected every two years; a unicameral council, and administrative officials as follows: chiefs of police and fire department, city electrician, and police matron, appointed by the executive; city physician, street commissioner, superintendent of public works, and collector, elected by the council; and city clerk, attorney, police judge, and treasurer, chosen by popular election. The municipal income in 1913 was $1,469,000, while the budget balanced at $1,669,000, the principal items of expense being $176,000 for schools, $79,000 for the fire department, and $55,000 for the police department, including amounts for police courts, jails, reformatories, etc. Pop., 1860, 3727; 1880, 13,138; 1900, 38,307; 1910, 45,941; 1914 (U. S. est.), 53,811; 1920, 64,997. Little Rock was settled in 1814. Six years later, with a population of less than 20, it became the seat of the Territorial government, though it was not incorporated until 1831, when its population numbered about 500. During the Civil War it was captured, Sept. 10, 1863, by a Union force under General Steele. Consult Powell, *Historic Towns of the Southern States* (New York, 1900).

LITTLE SCHÜTT ISLAND. See Schütt.

LITTLE SNAKE ISLAND. See Anguilla.

LITTLE TIBET. See Baltistan.

LITTLETON, lĭt′tl′ton. A town in Grafton Co., N. H., 111 miles by rail north by west of Concord, on the Ammonoosuc River, and on the Boston and Maine Railroad (Map: New Hampshire, F 4). The superb scenery of the White Mountains makes it popular as a summer resort. The great water power from the river has developed the manufacturing interests, the principal products being whetstones, gloves, shoes, bobbins, and excelsior. There is a Carnegie library and a hospital. Littleton was settled in 1770 and was known as Apthorp until 1784, when it was incorporated under its present name. The water works and electric-light plant are owned by the town. Pop., 1900, 4066; 1910, 4069. Consult *Granite Monthly*, vol. v (Concord, N. H., 1881), and *History of the Town of Littleton* (3 vols., Cambridge, Mass., 1905).

LITTLETON, Edward, Lord (1589–1645). An English jurist, born at Munslow, Shropshire. He graduated at Oxford in 1609 and was appointed Chief Justice of North Wales in 1621, succeeding his father. In 1626 he was elected to Parliament and in 1628 was chairman of the committee of grievances in whose report was the substance of the Petition of Right. In 1631 he was appointed Recorder of London, and in 1634 he was made Solicitor-General. He became Chief Justice of Common Pleas in 1640 and Lord Keeper of the Great Seal in 1641, with the title of Lord Littleton of Munslow. In 1642 he escaped with the Great Seal to Charles I at York, in 1643 was required by Parliament to restore it on pain of losing his place, and in 1644 was appointed First Commissioner of the Treasury.

LITTLETON, Sir Thomas (1402–81). An eminent English judge and law writer. He was born at Frankley Manor House in the northern part of Worcestershire and was educated at the Inner Temple. His earliest public services were as escheator of Worcestershire, undersheriff of Worcestershire, and recorder of Coventry. As reader to the Inner Temple, he lectured on the Statute of Westminster II, *De Donis Conditionalibus*. In 1453 he became a sergeant at law. In 1455, a few days before the opening battle of the Wars of the Roses, he was appointed one of the King's sergeants at law, and he was reappointed in 1461, when Henry VI was deposed and Edward IV assumed the crown. While King's sergeant, he had much experience of a judicial nature, being frequently in commissions of the peace, of oyer and terminer, and of assize. In 1466 he was made a judge of the Common Pleas. In 1470, when Henry VI was restored, Littleton, like the other judges, was reappointed, and he was also reappointed in 1471, when Edward IV displaced Henry VI permanently. While judge of the Common Pleas, he was in many commissions of oyer and terminer and of the peace, particularly for Worcestershire and counties to the west and north. In 1475 he was made by Edward IV a Knight of the Bath. He died in 1481 and was buried in Worcester Cathedral. His tomb, prepared by himself, is still in existence. The famous treatise by which Littleton is best known, *The Tenures*, which has been correctly described as one of the most famous books ever published, was written towards the close of the author's life, as a book of instruction for his son, and gives a picture of the law of land under the feudal system. It is noted for accuracy and clearness. The first edition appeared in 1481 or 1482, being one of the earliest books printed in London and the earliest treatise on English law printed anywhere. The second edition was printed about 1483 in London, and the third about 1490 at Rouen. These editions and many others were in the original Law French. There have also been many editions in English. In 1628 appeared the celebrated commentary of Coke. There have been about 25 editions of Coke upon Littleton and about 90 editions of *The Tenures* without the commentary. With or without commentary, *The Tenures* formed an important part of legal education for almost three centuries and a half and is still cited in the courts of England and the United States as an authority on the feudal law of real estate. For biographical and bibliographical details, consult Professor Wambaugh's learned introduction to the 1903 edition of *The Tenures* (Washington).

LIT′TLE TURTLE (?–1812). A celebrated Indian chief of the Miami nation, distinguished for his ability, shrewdness, and courage. He commanded the Indian force which defeated General Harmer on the Miami River in 1790 and that which defeated General St. Clair at St. Mary's in 1791, participated in the battle of Fallen Timbers in 1794, and was one of the chiefs who signed the Treaty of Greenville in 1795. In 1797 he visited President Washington in Philadelphia.

LITTLE WOMEN. A popular child's story by Louisa M. Alcott (1868).

LITTMANN, lĭt′mȧn, Enno (1875–). A German Orientalist. He was born in Oldenburg and early undertook important travels in Abyssinia, Syria, and Palestine. After being lecturer on Semitic philology for several years at Princeton University, in 1906 he went to Strassburg as professor of Semitic languages, returning to this chair after spending the years 1910–12 at the University of Egypt. He had accompanied the Princeton archæological expeditions to Syria and to Abyssinia and in 1906 was a member of the German Axum expedition. Besides his part in the publications of the reports of these expeditions, he wrote: *Arabische Schattenspiele* (1901); *Zur Entzifferung der Safâ-Inschriften* (1901); *The Chronicle of King Theodore of Abyssinia* (1902); *A List of Arabic Manuscripts* (1904); *Zur Entzifferung der thamudenischen Inschriften* (1904); *Philosophi Abessini* (1904); *Geschichte der äthiopischen Litteratur* (1907); *Arabische Beduinenerzählungen* (1908); *Nabatæan Inscriptions* (1913).

LIT′TORAL DEPOSITS. See Sand; Conglomerate: etc.

LITTORALE, lĭt′tō-rä′lå. A district of Austria. See Küstenland.

LIT′TORAL FA′CIES, fā′shĭ-ēz. See Paleontology.

LITTORAL PLANTS. See Beach Plants.

LITTORINA, lĭt′ō-rī′nȧ. See Periwinkle.

LITTRÉ, lē′trā′, Maximilien Paul Emile (1801–81). A French lexicographer, philosopher, and physician, born in Paris, Feb. 1, 1801. The life of Littré was neither brightened nor marred by dramatic incidents. His history is that of his mind, which was one of the most clear and energetic of the nineteenth century. Littré's capacity for work was prodigious, his interests universal. Having studied at the Lycée Louis-le-Grand, he became secretary to Count Daru; then he was a student of medicine and an interne. The death of his father set Littré to teaching modern languages and mathematics, but meanwhile he was deep in the ancient tongues, including Sanskrit, and may have studied other Oriental languages. He shared in the upheaval of 1830 as a Democrat, working with Armand Carrel on the *National*. In 1839 he joined the Académie des Inscriptions et Belles-Lettres. About the same time he espoused the positive philosophy (see POSITIVISM), but his mind sought other paths than Comte's. Auguste Comte (q.v.) lacked Littré's knowledge of biology. Littré was less mathematical than Comte, but Littré would have nothing to do with the mysticism of Comte's old age. In 1863 he published *Auguste Comte et la philosophie positive*, partly as a tribute to his former master, partly to set forth his modifications of this philosophy. In 1871 Littré, who had against his will lived in Bordeaux during the siege of Paris, was made professor of history and geography at the Ecole Polytechnique at Bordeaux, but he lectured only once. Dec. 30, 1871, eight years after his first candidacy, Littré was elected to the chair left empty by Villemain in the Academy. In 1871 Littré was a member of the National Assembly, and in 1875 he was elected life member of the Senate. To medicine Littré contributed *Choléra oriental* (1832), a translation of Hippocrates (1839–61), and, with Robin, a new edition of Nysten's *Dictionnaire de médecine*. In this work occurs his definition of man as "a mammal of the order of primates, of the class with two hands," etc.—a definition which enraged Dupanloup. Littré's *Médecine et médecins* (1872) and his translation of Müller's *Handbook of Physiology* (1846), with his translation of Pliny's *Natural History* (1848–50), are notable, as is the translation of Strauss's *Life of Jesus* (1839–40); but Littré's greatest work is the *Dictionnaire de la langue française* (1863–72; Supp. 1877), which he was encouraged to make by his friend the publisher Hachette (q.v.). Littré was well fitted for his task, which he began upon about 1844. His vast learning, his previous experience in lexicography, his lucidity, his patience, and his energy stood him in good stead. Above all, Littré began his *Dictionnaire* when Romance philology had already become modern, and he knew how to avail himself of the best. The history of this thesaurus Littré has told in *Comment j'ai fait mon dictionnaire* (new ed., Paris, 1897) and in the *Préface*. Among his other works may be mentioned his *Origines organiques de la morale* (1870), his *Poésie homérique et l'ancienne poésie française* (1847), his various researches in positivism, and his contributions to the *Journal des Savants* and to the *Histoire littéraire de la France*. The personality of Littré is charmingly revealed in his *Etudes et glanures* (1880). He was simple of heart, high-minded, and even-tempered.

Bibliography. C. A. Sainte-Beuve, "Notice sur M. Littré, sa vie et ses travaux," in the *Nouveaux Lundis*, vol. v (Paris, 1863); Dupanloup, *Avertissement aux pères de famille*, a polemical pamphlet (ib., 1863); Louis Pasteur, *Discours de réception à l'Académie Française* (ib., 1882); Ernest Renan, *Discours en réponse à celui de Pasteur* (ib., 1882); Caro, *Littré et le positivisme* (ib., 1883); A. F. C. Saint-Hilaire, *Souvenirs personnels sur Littré* (ib., 1895); Giuseppe Carducci, *Opere*, vol. iii (Bologna, 1897).

LITTROW, lĭt′rō, JOSEPH JOHANN VON (1781–1840). An Austrian astronomer and mathematician, born at Bischofteinitz, Bohemia. He became director of the Cracow Observatory in 1807 and of the Kasan Observatory in 1810, in 1816 was made associate director of the observatory at Budapest and in 1819 was called to the University of Vienna as professor of astronomy and director of the observatory, which owes to him a thorough reorganization. His lectures were extremely popular. His published works include: *Theoretische und praktische Astronomie* (3 vols., 1821–27); *Dioptrik, oder Anleitung zur Verfertigung der Fernrohre* (1830); *Gnomonik, oder Anleitung zur Verfertigung aller Arten von Sonnenuhren* (1831; 2d ed., 1839); *Atlas des gestirnten Himmels* (1838; 4th ed., 1886); an excellent popular exposition of the principles of astronomy, entitled *Die Wunder des Himmels* (1834–36; 8th ed., 1894–97). Consult his biography in his *Vermischte Schriften* (Stuttgart, 1846).

LITTROW, KARL LUDWIG VON (1811–77). An Austrian astronomer, born at Kasan, the son of Joseph Johann von Littrow, whom he succeeded in 1842 as director of the Vienna Observatory. The publication of the meteorological records of the observatory from 1755 on was due to his efforts, and he brought the *Annalen* of the observatory to a high grade of scientific perfection. He devised a new method of reckoning longitude at sea, edited his father's works, adding largely to his *Wunder des Himmels*, and wrote a valuable *Verzeichnis der geographischen Ortsbestimmungen* (1844–46) and *Populäre Geometrie* (1839).

LITUITES, lĭt′ū-ī′tēz (Neo-Lat., from Lat. *lituus*, augur's staff). A genus of fossil tetrabranchiate cephalopods allied to *Nautilus*, found in rocks of Ordovician and Silurian age. The shell in its young stages resembles that of the primitive *Nautilus* in being closely coiled, but in its adult condition the last whorl straightens out and grows at a tangent to the coiled portion to form a long straight shell, in much the same manner as does the shell of the Cretaceous *Baculites* (q.v.). This straightening of the last whorl shows among the later species of Silurian time in much younger individuals than it does in the earlier species of Ordovician time, and thus affords an illustration of accelerated development of an acquired characteristic. Consult A. S. Hyatt, "Phylogeny of an Acquired Characteristic," in *Proceedings of the American Philosophical Society*, vol. xxxii (Philadelphia, 1894).

LITUR′GICAL MUSIC. See SACRED MUSIC.

LIT′URGY (Gk. λειτουργία, *leitourgia*, service, from λειτουργός, *leitourgos*, minister, from λεῖτος, *leitos*, public + ἔργον, *ergon*, work). A form of public worship, especially for the celebration of the Lord's Supper. The word is frequently used in the Septuagint translation of the Old Testament to denote the great public service of the Hebrews, the sacrifices of the Temple, and the work of the priests. Thence it passed into the New Testament, where it is used for any ministry, including the ministry of the worship of the Church. Its ecclesiastical use was soon limited to the public religious service and especially to the Lord's Supper, which is still called in the Greek church "the Divine Liturgy."

From the days of the Apostles there has been a form of worship connected with the Lord's Supper, reproducing in more or less detail the words and actions of the first institution of that

Sacrament by Christ. This form was influenced in some degree by the Passover ritual and also by the methods of observing the Sabbath eve in the Jewish household. The references to the liturgy in the first three centuries are not very numerous, but by a comparison of these we are led to think that in the ante-Nicene period there was a form of service very similar in all parts of the Church. Such a form appears in the early documents from which the Eighth Book of the Apostolic Constitutions was compiled.

With the conversion of Constantine a new epoch in the history of the liturgy begins. The influx of large numbers of the higher classes into the Church, the decay of the catechumenate, the building of large and magnificent places of worship, resulted in the enrichment of the service and the elaboration of the ritual.

In various parts of the Empire the development was different, and as a result we have a number of types of liturgy resembling each other in their main features, but differing in details; in all of them the service is divided into two great parts, the first devoted to instruction and consisting of the reading of Scripture, sermon, and prayers. To this part of the service all were admitted, and it received the name of *Missa Catechumenorum*, or the Mass of the Catechumens.

The second part was reserved for those who were to partake of the Sacrament and was called *Missa Fidelium*, or Mass of the Faithful; this began with the kiss of peace, then followed the offering of the bread and wine, the *Sursum Corda*, Preface, the great prayer of thanksgiving (Eucharist) including the words of institution; this was followed by the invocation of the Holy Spirit upon the elements and intercession for the living and dead. After this, the consecrated elements were distributed, with a formula, and the service ended with a prayer of thanksgiving and the dismissal of the faithful. The names *Missa Catechumenorum* and *Missa Fidelium* are of Western origin, but the Greek liturgies are divided on nearly similar lines into Proanaphora and Anaphora. The word *anaphora* is the Greek equivalent of *sursum corda* (lift up your hearts).

The two great classes of liturgies, the Eastern and the Western, may be subdivided into families. The best division of the Eastern liturgies is into national rites.

The *Syrian rite* had its centre at Antioch and is at present represented by the Greek liturgy of St. James, still used on the festival of that saint at Zante. Some account of the earlier form of this liturgy can be gathered from the earlier writings of St. Chrysostom. The Maronite church of Mount Lebanon still uses a Syriac version of this liturgy. The services in the early Church at Jerusalem as reconstructed from the writings of St. Jerome and St. Cyril, and the *Peregrinatio* of St. Silvia show a very strong resemblance to this liturgy; it is also closely related to the liturgy found in the Apostolic Constitutions and known as the Clementine liturgy.

The *Persian rite*, now used by the sect of Nestorians, is represented by the liturgy of *The Apostles Addai and Mari*. The centre of this rite is at Edessa. There is one common proanaphora, to which may be attached numerous anaphoras. The language is Syriac. Recently many of these Nestorians have joined the Orthodox Eastern church and use its liturgy.

The *Byzantine rite* is the most important of all the Eastern rites and is used throughout the world in many different languages. It is the rite of the great Russian church, of the Greek church, and of other smaller communions. There are three liturgies in this rite, that of St. John Chrysostom, that of St. Basil, and that of St. Gregory Dialogos or the Presanctified. The two latter are used only on special days, while that of St. Chrysostom is the ordinary liturgy. It is this rite which is used in the Greek churches in America. The *Armenian liturgy* is a daughter of the Byzantine, though in its present form it has been influenced by the Roman.

The *Egyptian rite*. In a manuscript recently discovered on Mount Athos and first published in 1899 we have a collection of liturgical prayers used by Bishop Serapion, a friend of St. Athanasius. It is probably not later than 350 A.D., giving us the earliest-known form of the Egyptian service, and should be compared with the more developed form in the liturgy of St. Mark, which is the typical Egyptian liturgy. The Copts still use a version of this liturgy.

In many of the Eastern communities there is a *Uniat rite*, which is a compromise between the Orthodox and the Roman forms, but usually contains the Roman Canon of the Mass.

The Western liturgies may be divided into the Latin and the Vernacular; the former represented now by the Roman Mass and the latter by the various Protestant liturgies.

The earliest references to the *Latin liturgy* of the West are found in the writings of the North African school, and it was probably in North Africa that the first Latin liturgy was used. At Milan St. Ambrose took great interest in the development of the service; as a result, we have the liturgy which bears his name and is still used in the diocese of Milan. The early Gallican liturgies were supplanted after Charlemagne by the Roman, and we know them only from such remains as have come down to us and are published in Mabillon, Mone, and others. The Christians in Spain under Arab rule used what is known as the Mozarabic liturgy, a form of which, revised by Cardinal Ximenes, is still in use in a few churches in Toledo. The Celtic or British church also had its own liturgy, which bears distinct traces of a connection with the Oriental rites. After the time of St. Augustine (597 A.D.) the older form gave way gradually to the form introduced by him, which was a modified form of the Roman. Before the Reformation there had developed in England a number of diocesan *Uses*, which, however, affected the eucharistic office but little. The most famous of these "uses" was the Sarum, which just before the Reformation was very widely used. From it was taken much of the present service of the Church of England.

The earliest extant form of the Roman liturgy, or *Mass*, is found in the "Leonine Sacramentary," probably compiled about 550 A.D. Later forms are found in the sacramentaries of Gelasius and Gregory the Great. From the eighth century on, Rome has striven to enforce uniformity in ritual and has succeeded in supplanting the various Latin uses until to-day her followers, with very few exceptions, use the same form of liturgy in all lands and all churches. See MISSAL.

The *Vernacular liturgies* of the West are the product of the Reformation. The leaders both in Germany and England tried at first to reform the Latin service, but soon abandoned it for a vernacular form. The earliest attempts were made in Germany between 1520 and 1526. In the latter year appeared Luther's German Mass, and from that time a large number of German services were compiled, some following the old Latin, while others made radical changes. The followers of Luther were inclined to be conservative, while those of Zwingli were more radical. A comparison of the Lutheran liturgies, or *Agendas,* of the sixteenth century shows a certain type of service which may be called normal, consisting of: (1) Introit; (2) Kyrie; (3) Gloria in excelsis; (4) collect; (5) epistle; (6) alleluia; (7) gospel; (8) creed; (9) sermon; (10) general prayer; (11) preface; (12) Sanctus and Hosanna; (13) exhortation to communicants; (14) Lord's Prayer and words of institution; (15) Agnus Dei; (16) distribution; (17) postcommunion thanksgiving; (18) benediction. With the rise of rationalism in the seventeenth century the older forms of liturgies gave place to a very bald, bare service, in which the congregation had no part. A revival and return to earlier forms began with the publication in 1822 of the *Kirchenagenda* for the Court and Cathedral Church of Berlin, and since that time new and revised agendas have been introduced in nearly all the German states, among the most important of which is the *Agende für die evangelische Landeskirche* introduced into Prussia in 1894.

The first agenda of the Lutheran church in America was the work of H. M. Mühlenberg in 1747. At present either "The Church Book" of 1891 or "The Common Service" of 1888 is used; but neither of these is rigidly enforced. Both of them represent a return to the earlier type of the sixteenth century.

Zwingli set forth a communion service for the Reformed church in 1525, which was to be used once a year in Holy Week. This was the liturgy used at Zurich as late as 1675. The form of liturgy recommended by Calvin is found in his *Manner of Celebrating the Lord's Supper.* After the sermon there was a long prayer, including a petition for the worthy reception of the sacrament; then followed (*a*) the Scripture lesson, 1 Cor. xi. 25–29; (*b*) an address warning all to examine themselves; (*c*) the communion, the elements given with a formula—during the reception Psalm cxxxviii is sung; the celebration closes with (*d*) the prayer of thanksgiving, (*e*) Song of Simeon, and (*f*) the blessing. The service is that now used in the Reformed church of America and was introduced in a modified form into Scotland by John Knox in his *Book of Common Order* and used until his death. This book gave great latitude for extempore prayer. Besides the office for the holy communion it contained various other services and alternate forms. In 1644 the Westminster Assembly adopted the Directory of Public Worship, in which the office for the holy communion is stripped almost entirely of its liturgical form, and room is made for the minister to use his own compositions. The communicants sit instead of kneeling at the Lord's Table. The minister reads the words of institution, then offers a prayer of blessing, and distributes the bread and wine with a formula. After all have communicated, the minister is to give solemn thanks to God.

The form of communion service used in the churches of the Anglican communion is found in the Book of Common Prayer of these churches. In character it occupies a ground between the liturgies of the Reformed and Lutheran churches on the one side and the Roman on the other. This service was first printed in 1549 and has been revised a number of times both in its English and American forms. The edition now in use in England is that of 1662; in America, that of 1892. The most marked peculiarity of the American form is due to the influence of the Scottish Nonjurors' office and consists in the addition of an Invocation of the Holy Spirit to the Prayer of Consecration. See PRAYER BOOK, COMMON.

Beginning with the Oxford movement in England in the first half of the nineteenth century, there has been a remarkable revival in the study of liturgies both in England and America, and many Christian bodies have shown an increasing tendency to introduce liturgical forms into their services.

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LITURGY, Jewish. See Synagogue.

LITUUS, lĭt′ū-ŭs. See Spiral.

LIU-CHIU ISLANDS. See Luchu Islands.

LIUDGER, lē′ụt-gẽr, Saint (c.740–809). The first Bishop of Münster in Germany. He was born in Friesland, but received his education in England, where he studied and did missionary work under Alcuin (q.v.). On his return to the Continent he sought to convert his fellow countrymen to Christianity, but in 784, at the time of Wittekind's mission to Friesland, temporarily abandoned the work and made a journey to Rome. Afterward he resumed his missionary labors and became the first Bishop of Münster. The various *Vitæ Sancti Liudgeri* have been published by Diekamp in four volumes entitled *Geschichtsquellen des Bistums Münster* (1881). For his life, consult: Hüsing (Münster, 1878); Pingsmann (Freiburg, 1879); Krimphove (Münster, 1886).

LIUDPRAND, lē′ụt-pränt, or **LIUTPRAND OF CREMONA** (c.992–c.972). An historian, to whom we owe much of our knowledge of the history of Italy in the tenth century. He came of a noble Lombard family. His father was Ambassador of King Hugo of Italy to Constantinople in 927 and died soon after. Liudprand was thereupon educated at the dissolute court of Hugo, but was early destined for the Church. Nevertheless he was throughout his life better versed in pagan learning than in Christian lore, and in his works biblical quotations are interwoven with many excerpts from Cicero, Vergil, Horace, and Ovid. After Hugo's power began to wane, Liudprand turned towards Berengar II (q.v.) and obtained a position in the new ruler's chancery. In 949 he went on an embassy to Constantinople, but soon thereafter he had a dispute with Berengar, and we do not hear of him again until 956, in which year he appeared at the court of King Otho of Germany. At the request of Bishop Recemund of Elvira, he began in 958 his best work, the *Antapodosis*. In it he attacks Berengar and his Queen, Willa, but also treats of the Italian history in the period 886 to c.952. He is not impartial, but interesting and learned. In 961 Otho the Great made him Bishop of Cremona, whence he is spoken of as Liudprand of Cremona. Throughout the Germanic invasion of Italy he played an important rôle, and in 968 he went to Constantinople to seek the hand of a Byzantine princess for the future Otho II, but the Emperor Nicephorus (q.v.) refused the proffered alliance. We have the experiences of this embassy preserved in Liudprand's *De Legatione* (Eng. trans. in Henderson's *Select Documents of the Middle Ages*, London, 1896). He died soon after his return. There is no foundation for the statement so often made that Liudprand also took part in the later successful embassy to Constantinople which obtained the hand of Theophano for Otho II. Besides the two works mentioned above, Liudprand also wrote: *De Rebus Gestis Ottonis Magni Imperatoris*, covering the period from 960 to 964. The best edition of his works is in the *Monumenta Germaniæ Historica* (Berlin, 1839) published separately (2d ed., Hanover, 1877). Consult: Köpke, *De Vita Liutprandi* (Berlin, 1842); Wattenbach, *Deutschlands Geschichtsquellen*, vol. i (7th ed., Stuttgart and Berlin, 1904); Osten-Sacken, "Aus Liudprands Werken," in *Geschichtsschreiber der deutschen Vorzeit* (2d ed., Leipzig, 1889).

LIU-KIU (lyo͞o′kyo͞o′) **ISLANDS.** See Luchu Islands.

LIUTPRAND, lē′ụt-pränt (c.690–744). A king of the Lombards (712–744), under whom they rose to their greatest power. He attacked and conquered Ravenna (728). In 739 he made an alliance with Charles Martel against the Arabs and three years later defeated the dukes of Beneventum and Spoleto. The result of his legal activity was the *Edicta Liutprandi*. Consult Hartmann, *Geschichte Italiens im Mittelalter* (3 vols., Gotha and Leipzig, 1897–1911).

LIVADIA, lē̇-vä′dē̇-ȧ. An estate of the Russian Imperial family on the south coast of the Crimea, Russia, situated about 3 miles southwest of Yalta (Map: Russia, D 6). It consists of two palaces surrounded by extensive parks and gardens. The new or Large Palace was built in 1911 from plans by Krasnov, while in the exceedingly simple Small Palace, close by, Alexander III died on Nov. 1, 1894. The adjacent Imperial estate of Oreanda contains the ruins of the palace burnt down in 1882.

LIVADIA, lĭv′ä-dē′ȧ (Lat., from Gk. *Λεβάδεια*, *Lebadeia*). A town of Greece, capital of the Nomarchy of Bœotia, situated on the western edge of the plain formed by the draining of Lake Copais. (See Bœotia.) In ancient times it was famous for the subterranean oracle of Trophonius (q.v.). Under Turkish rule it was the most important town in northern Greece. The town lies at the foot of a steep hill crowned by a ruined castle, attributed to the Catalan Grand Company (q.v.). The site of the cave of the oracle is not with certainty identified. Pop., 1909 (according to Baedeker), 6250. See Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

LIVE-FOREVER. See Houseleek.

LIVENS, Jan. See Lievens, Jan.

LIVE OAK. A town and the county seat of Suwannee Co., Fla., 81 miles west of Jacksonville, on the Seaboard Air, the Atlantic Coast, the Florida, and the Live Oak, Perry, and Gulf railroads (Map: Florida, D 1). It is a shipping point for early vegetables for the North, and has also a considerable trade in lumber, brick, lime, limestone, cotton, corn, hay, and live stock. The town contains a public library, city hall, and the Suwannee Springs. There are municipal water works. Pop., 1900, 1659; 1910, 3450.

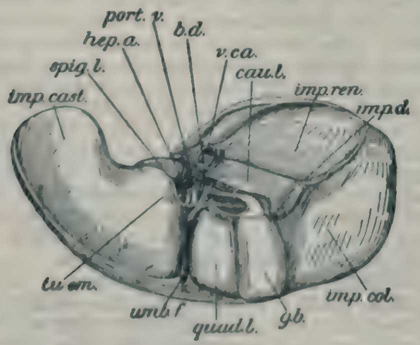
LIVE OAK. See Oak.

LIV′ER (AS, *lifer*, OHG. *libara, lebara*, Ger.

Leber; probably connected ultimately with Lat. *jecur*, Gk. *ἧπαρ, hēpar*, Armen. *leard*, Skt. *yakṛt*, liver). The largest gland in the body; it weighs from three to four pounds, and measures about 12 inches from side to side, and 6 or 7 inches from its anterior to its posterior border. It is situated in the right hypochondriac region, and reaches over to the left. It is thick and indented behind, where it crosses the convex bodies of the vertebræ; convex on its upper surface, where it lies in the concavity of the diaphragm; and concave below, where it rests against the stomach, colon, and right kidney. This lower surface presents a fissure dividing the organ into a right and a left lobe. The liver is retained in its position by five ligaments. Besides the right and left lobe, there are three smaller lobes. The great bulk of the organ is, however, made up of the right lobe, which is six times as large as the left.

The vessels of the liver are the hepatic artery, a branch of the cœliac axis (see AORTA), which supplies the organ with nutrient blood; the portal vein, which conveys to the liver the venous blood of the intestines, spleen, and stomach; the hepatic veins, which convey the blood from the liver into the inferior vena cava; the hepatic duct, which carries off the bile from the liver; and the lymphatics.

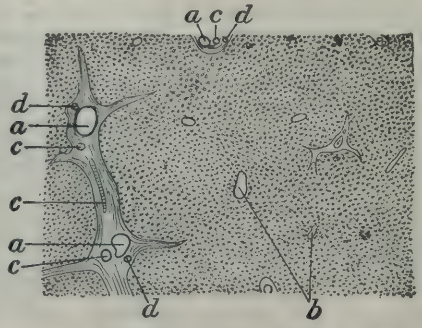
The liver, both on its surface and internally, is of a dark reddish tint. The substance of the organ is composed of lobules held together by extremely fine areolar tissue, and ramifications of the minute branches of the various hepatic vessels. Each lobule is composed of a mass of hepatic cells, of a plexus of biliary ducts, of a portal plexus (from the contents of which the cells obtain the biliary matters that are found in their interior), of a branch of the hepatic vein, and of minute arteries. The exact mode in which the bile formed in the cells makes its way into the ducts is not known. The numberless minute ducts gradually run into one another, until, as they emerge from the lower surface of the liver, they are reduced to two large trunks, which soon unite to form the hepatic duct. Into the hepatic duct, the cystic duct from the neck of the gall bladder (presently to be described) enters, and the two combine to form the common duct (*ductus communis choledochus*), which opens into the duodenum. (See DIGESTION, ORGANS AND PROCESS OF.) This common excretory duct of the liver and gall bladder is about 3 inches in length, and of the diameter of a goose quill.



INFERIOR SURFACE OF HUMAN LIVER.

Imp. cast., impressio gastrica; *spig. l.*, spigelian lobe; *hep. a.*, hepatic artery; *port. v.*, portal vein; *b. d.*, bile duct; *v. ca.*, vena cava; *cau. l.*, caudate lobe; *imp. ren.*, impressio renalis; *imp. d.*, impressio duodenalis; *imp. c.*, impressio collica; *tu. om.*, tuber omentale; *umb. f.*, umbilical fissure; *quad. l.*, quadrate lobe; *g. b.*, gall bladder.

The chemical composition of the liver in health is as follows: 68.6 per cent of water and 31.4 per cent of solid constituents—of which 3.8 are fat, 4.7 albumen, while the rest is made up of vessels, salts, and extractive matters. (In the diseased condition known as fatty degeneration of the liver, the fat is enormously increased.) Sugar, varying in amount from 1 to 2 per cent, is also found; and inosite, uric acid, sarcine, xanthine, and leucine usually occur in traces.



SECTION OF HUMAN LIVER.

Showing general arrangement of lobules: *a*, interlobular (portal) vein; *b*, intralobular (hepatic) vein; *c*, hepatic artery; *d*, bile ducts; the boundaries of the lobules are imperfectly defined by the irregular areas representing the poorly developed capsule of Glisson.

The gall bladder may be regarded as a *diverticulum* or offshoot from the hepatic duct. It has somewhat the shape of a pear, and lies in a depression on the undersurface of the liver. Its use seems to be to serve as a reservoir for the accumulation of the bile, when its flow into the intestine is interrupted, as it is always found full after a long fast, and empty when digestion is going on. That the gall bladder is not an essential appendix to the liver is shown by the fact that it is absent in many genera of mammals and that it may be removed from man without harmful effects.

Physiology. It was formerly believed that the liver served merely for the separation of the biliary secretion from the blood; but there is now abundant evidence that the organ has several other functions. The changes which take place in the liver cells result in (1) the formation of bile; (2) the production of glycogen; (3) the formation of urea. The liver also, next to the skeletal muscles, is an important source of animal heat. The formation of bile is the result of cellular activity on the part of the liver. Experiments on frogs and birds show that no bile can be formed when the liver has been extirpated. The coloring matter of the bile is derived from the blood, the substances connecting the blood and bile pigments being the following: hæmatoporphyrin, which very closely resembles bilirubin, and hæmatoidin, a substance found in old blood extravasations, which is probably identical with it. The bile is formed from the blood of the portal vein and not from that of the hepatic artery, as was formerly thought. The second function of the liver, the formation of glycogen, was discovered by Claude Bernard (q.v.) by experiments on dogs. Bernard fed a dog for seven days with food containing a large quantity of sugar and starch, and, naturally, found sugar in both the portal and hepatic blood; but when the diet was restricted to meat, Bernard still found sugar in the blood of the hepatic vein, but none in the portal vein if this were cut off so as to prevent a reflux of blood from the hepatic system. Bernard also found sugar in the substance of the liver. It was thus proved that the liver was capable of forming sugar from other substances besides carbohydrates. Bernard found later that a liver removed from the body, and from which all sugar had been completely washed away by injecting a stream of water through its blood vessels, would still contain a considerable quantity of sugar. This fact could only be explained by supposing that the liver contained a substance readily convertible into sugar, a supposition subsequently proved correct by the discovery of a starchy substance now called glycogen. Although glycogen is produced most freely under a diet of sugar or starch, it is also manufactured, though in less amount, from a proteid diet. The experiments of Pavy upon dogs showed that the average amount of glycogen in the liver of dogs fed on animal food was 7.19 per cent; when fed on food mixed with sugar, 14.5 per cent; and on a vegetable diet (potatoes, with bread and barley meal), 17.23 per cent. Another series of experiments by Pavy, on rabbits, demonstrated the dependence of the formation of glycogen on the kind of food eaten. Pavy found that in the livers of rabbits which had fasted three days glycogen was practically absent; on a diet of starch and grape sugar he found 15.4 per cent glycogen, and on a diet of cane sugar, 16.9 per cent. Glycogen is also formed to some extent on a gelatin diet. Fats do not produce it.

The present views of the glycogenic function of the liver were only arrived at after a long series of experiments and much debate. Nearly all physiologists admit that Bernard demonstrated it completely, although for a long time many apparently well-made experiments seemed to throw great doubt on the subject, some believing that the sugar found by Bernard was a product of post-mortem changes. It is a fact that it is difficult to find sugar in the liver which may not be said to be produced after death; consequently, demonstrative experiments are exceedingly difficult. On examining the blood which comes from the lungs in animals upon which vivisection has been performed it is found to contain no sugar. Other experiments have left no doubt of the fact that, to serve some purpose in the animal economy, sugar is destroyed in its passage through the lungs, the most generally received view being that it is converted into lactic acid, which unites with the alkalies in the blood to form lactates, which again are converted into carbonates. It is thought that among the causes of the disease diabetes is an abnormal performance of the function of respiration (q.v.). The glycogenic matter of the liver, in composition, reactions, and particularly in its readiness to be transformed into sugar, has considerable resemblance to starch, and is called by some authors amyloid matter. On account of its insolubility in water it may be extracted from the liver after all the sugar has been washed out. See LIVER, DISEASES OF THE.

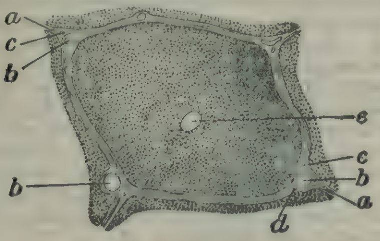
There are two main theories as to what becomes of hepatic glycogen. One is that this substance is converted into sugar during life by means of a ferment called *liver diastase*, which is also produced in the liver; and that the sugar thus formed is conveyed by the blood of the hepatic veins to the various tissues, there to undergo combustion, i.e., oxidation. The second theory is that the conversion into sugar is a post-mortem phenomenon, and that during life no sugar exists in healthy livers.

There is a considerable amount of evidence to show that some of the urea is formed by the liver, though not all of the urinary solids are produced by the hepatic cells. It is certain, however, that urea is not secreted by the kidneys, whose function is merely one of separation. Urea is derived from proteids, and there is evidence to connect its production with one, if not two, of the products of digestion of proteid substance in the alimentary canal, viz., *leucine* and *tyrosine*. These substances are believed to be the result of pancreatic digestion, and, to some extent, possibly of the action of microörganisms. The connection between leucine and tyrosine and urea is supposed to be as follows: These materials, formed during intestinal digestion, are carried by the portal vein to the liver. By the action of the hepatic cells they are converted into urea, which is then conveyed by the hepatic veins into the general circulation and in due time reaches the kidneys and is there eliminated from the body. This view is supported by the observation that the introduction of leucine into the alimentary canal increases the amount of urea in the urine, but leucine itself does not appear. Again, in acute yellow atrophy of the liver, in which rapid destruction of its cells takes place, the urea of the urine is replaced by leucine and tyrosine. Lastly, the liver is found to contain a considerable amount of urea, differing in this respect from other glands; and if blood be passed through the liver of a recently killed animal its urea content is greatly increased. The use of the bile in the digestive process is sufficiently explained in the article DIGESTION, ORGANS AND PROCESS OF.

This important gland first shows itself in the form of yellowish-brown cells in the polyps, and gradually becomes more concentrated and developed in the echinoderms, annelids, nudibranchiate gastropods, insects, crustaceans, air-breathing mollusks, cephalopods, fishes, reptiles, birds, and mammals. The physiological anatomy of the liver may be briefly stated as follows: The lobules previously mentioned are about $\frac{1}{25}$ of an inch in diameter and of an ovoid shape. They are surrounded by a plexus of blood vessels, nerves, and ramifications of the hepatic duct, comprising what are called the interlobular vessels. These are all inclosed by a sheath which is a prolongation of the proper coat of the liver (capsule of Glisson), but attached loosely by areolar tissue. This sheath follows the vessels to the subdivisions within the interlobular spaces (spaces between the lobules), but does not extend to the capillary vessels *within* the lobules. In a few animals, as the pig and polar bear, the lobular structure can be seen with the naked eye, but in man and most mammals it cannot. The lobules are intimately connected with each other, branches of the interlobular vessels being each distributed to several of the lobules. Any one lobule, however, may be considered as representing the physiological anatomy of the whole liver, and the study of its anatomy and functions will answer for the study of the whole gland. The lobules receive blood at their surfaces from the capillary terminations of the portal vein, these vessels having received the terminations of the hepatic artery before passing into the lobules. It is very important to bear in mind this peculiarity of distribution, which is often overlooked. The branches of each hepatic vein, the vessel which carries the blood from the liver to the ascending great vein (ascending vena cava), by which it is returned to the heart and lungs, have their origin *within* the lobules. Their capillary extremities arise from the capillary ramifications of the portal vein and, passing towards the centre of the lobule, converge into three or four radicles, which, uniting at the centre, form the *intralobular* veins, which are the commencement of the hepatic veins. These intralobular veins, which are in the centre of each lobule, are from $\frac{1}{1000}$ to $\frac{1}{400}$ of an inch in diameter, and they follow the long axis of the lobule, receiving vessels in their course till they empty into larger vessels situated at the base of the lobules, called by Kiernan sublobular veins. They collect the blood from all parts of the liver, and, increasing in size by union with one another, they at last form the three hepatic veins which discharge the blood from the liver into the ascending vena cava. Now, these hepatic veins are a long way from the influence of the heart's action, lying as they do between the portal circulation and the veins going to the heart; but a provision has been made to assist in the propulsion of their contents, and they are supplied with a muscular coat composed of unstriated muscular fibres. The most essential elements of the lobule, or of the liver, are the hepatic cells, which are the true secreting elements of the gland. They are minute, polygonal-shaped bodies about $\frac{1}{1000}$ of an inch in their longest and $\frac{1}{1500}$ in their shortest diameter, having one nucleus, or sometimes two nuclei, with some granular matter. (See CELL.) They are surrounded by an independent network of extremely minute vessels $\frac{1}{10,000}$ of an inch in diameter, of uniform size throughout, called the biliary capillaries, in which the bile first makes its appearance.

As the bile ducts increase in size they contain numerous follicles and cluster-like glands which are called racemose (the biliary acini of Robin), and they continue to occupy the biliary passages as far as the *ductus communis choledochus*, or the common bile duct, which empties into the intestinal canal. Those which are found in the smallest ducts are simple follicles from $\frac{1}{800}$ to $\frac{1}{400}$ of an inch in length. The larger of these glands are formed of groups of these follicles, and are from $\frac{1}{250}$ to $\frac{1}{100}$ of an inch in diameter. The nutrition of the liver is provided for by the hepatic artery, which has three sets of branches. As soon as it enters the sheath formed by the capsule of Glisson, it sends off very fine branches, called *vasa vasorum*, to the walls of the portal vein, to those of the hepatic vein, to its own branches, and an exceedingly rich and beautiful network of branches to the hepatic duct. When the hepatic artery is well injected it almost completely covers the duct with its ramifications. The hepatic duct proper, or that single vessel so called lying outside of the liver, is formed by the union of two ducts, one from the right and one from the the left lobe of the liver. It is about 1½ inches long, and joins the duct from the gall bladder, called the cystic duct, to form the common duct, or *ductus communis choledochus*, which is about 3 inches long and of the size of a goose quill, and empties, in common with the pancreatic duct, into the intestine, a little below the middle of the duodenum, or about 5 inches below the stomach. The gall bladder is an elongated, pear-shaped sac about 4 inches in length and 1 inch in breadth, having a capacity of about one and a half fluid ounces. The cystic duct, connecting it with the hepatic duct, is the smallest of the three larger ducts and is about 1 inch in length. In the gall bladder there are also numerous small racemose glands similar to those above mentioned as existing in the biliary ducts generally. They consist each of from four to eight follicles lodged in the submucous tissues. They secrete mucus mixed with bile. The idea has been entertained by some that these biliary racemose glands found in different parts of the biliary ducts were the bile-producing glands, while the hepatic cells were the organs for secreting sugar, or, in other words, for the conversion of the glycogenic matter of the liver into glucose, or grape sugar; but this view has not been found tenable. The nerves of the liver are derived from the pneumogastric, the phrenic, and from the solar plexus of the great sympathetic. They all penetrate the gland at the great transverse fissure, and follow the blood vessels in their course of distribution to the various parts of the organ, but their terminal distributions are not yet well understood. The lymphatic vessels of the liver are numerous and consist of two layers. The outer or superficial layer is situated immediately beneath the serous or peritoneal covering. The inner or deeper layer forms a plexus surrounding the lobules, having entered the liver along with the portal veins, hepatic arteries, and bile ducts, enveloped in sheaths of Glisson's capsule. In their course they invest the branches of both ducts and blood vessels with a delicate network of tubes, and on arriving at the surface of the lobules they enter them and form another remarkable network of lymphatic passages, traversing the lobule in every direction. Every blood capillary is enveloped in a lymphatic sheath in very much the same manner that the interlobular vessels are enveloped in the sheath of Glisson's capsule. These lymphatic sheaths surrounding the other vessels are otherwise called the perivascular lymphatic spaces, and are similar in structure to those which are found in various parts of the body. See LYMPHATIC.

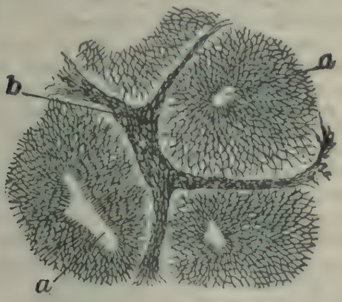
Histology. The macroscopic divisions of the liver which are known as lobes are subdivided microscopically into lobules by extensions inward of the connective tissue of Glisson's capsule. In some of the lower animals, e.g., the pig, each lobule of the liver is completely surrounded by this connective tissue. In man the amount of connective tissue is small and does not form a complete investment for each lobule. The demarcation of the lobules is, therefore, not at all sharp. The structure of a liver lobule may be described as follows: At the centre of each lobule is the central vein, which is a branch of the hepatic vein. Passing out in a radiating manner from this central vein is a dense network of capillaries in the meshes of which lie the cords of liver cells. These liver cells are polyhedral in shape, granular, and contain rather large nuclei. In the connective tissue which lies at the junction of three or more lobules is found the group of vessels known as the portal canal and consisting of the hepatic artery, the portal vein, and the bile duct. The smaller bile ducts consist of a single layer of columnar epithelium surrounded by a thin layer of connective tissue. In the larger ducts there is a well-defined mucosa consisting of a single layer of epithelium resting upon a stroma, outside of which are a few smooth muscle cells and some fibrous tissue. Usually at some distance from the portal system in the connective tissue between two adjacent lobules is the sublobular vein, a branch of the hepatic vein, into which the central veins empty.



SECTION OF LIVER OF HOG.

Showing very diagrammatically the lobules; *a*, interlobular connective tissue; *b*, *c*, branches of portal vein and hepatic artery; *d*, bile ducts; *e*, interlobular vein.

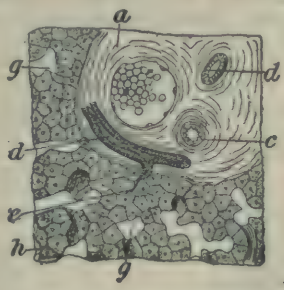
The blood supply of the liver is very large, being conveyed by two distinct systems—the portal system and the hepatic system. The portal vein and the hepatic artery enter the liver at the hilus and, entering the organ, divide and subdivide, following the extensions inward of Glisson's capsule. Upon reaching the boundary of the lobules the vessels break up into the intralobular capillary network already referred to. Distinct up to the time of entering the lobule, the blood of the two systems mingles at some point within the lobule capillaries and empties into the above-mentioned central vein, whence it finds its way into the hepatic vein. Bile capillaries extremely minute in size originate within the lobules and follow the cords of liver cells to the periphery of the lobules, where they empty into the smaller bile ducts. Lymphatics accompany the blood vessels, forming in the capsule a superficial lymphatic system, in the substance of the liver proper a deep lymphatic system. The nerves of the liver enter the organ at the hilus in company with the blood vessels and lymphatics. They are composed mainly of nonmedullated fibres, although some medullated fibres are intermingled. They branch, following the subdivisions of Glisson's capsule, and reach the periphery of the lobules. Extremely minute fibrils enter the lobules to terminate in end arborizations among the liver cells.



SECTION OF INJECTED HUMAN LIVER.

The capillaries having been filled from the central vein, *a*; *b*, branches of portal vein.

The two distinct functions, that of the production of bile and the formation of sugar, which are now generally recognized as being performed by the liver, have led some physiologists to suppose that this gland is composed of two distinct portions or anatomical elements, and Robin has adopted this theory and calls one portion of the liver a biliary organ and the other a glycogenic or sugar-forming organ. The lobules and hepatic cells, with their different vessels, he regards as performing the glycogenic function, and the little racemose glands which are attached to the biliary ducts along their course as the bile-producing organs; and others have entertained ideas of the independence of the sugar-making and bile-producing portions of the organ. But from the fact that bile is commonly found in the lobules, and that the biliary capillaries are connected with the excretory biliary ducts, the conclusion seems to be unavoidable that the bile is formed in the lobules, and, moreover, by the hepatic cells. It therefore becomes a question as to what are the functions of the little racemose glands attached to the larger bile ducts. They have much the form of mucous glands in other parts of the body, and from the examinations of Sappey, who has found the bile to be viscid in proportion to the number of these glands in the ducts containing it, they appear to be really mucous glands. In the rabbit, an animal in which these glands are not found in this situation, the bile is quite fluid, and free from its ordinary viscidity. It has generally been thought that the bile was secreted exclusively from the blood which has been brought from the intestines by the portal vein, and that, indeed, the principal office of the liver was to separate effete matter from this portion of the venous system; but many experiments which have been made since Bernard discovered the glycogenic function of the liver go to show this idea erroneous. It has also been thought that the hepatic artery may furnish material for the secretion of bile, while the portal vein furnished that for the production of sugar; but these views again are quite overthrown by many well-established facts and experiments. It has been found that, after the ligation of the hepatic artery, bile has been



SECTION OF LIVER OF DOG.

Including portion of lobule and interlobular or connective tissue, *a*; *b*, portal vein; *c*, hepatic artery; *d*, bile ducts; *e*, small peripheral bile vessel; *g*, blood channels; *h*, hepatic tissue.

secreted from blood furnished by the portal vein, and this view is now generally accepted; but the experiments of Oré, who succeeded in gradually obliterating the portal vein without immediately producing death, apparently show that bile is secreted from blood furnished by the hepatic artery. In one instance in which a patient died of dropsy the portal vein was obliterated, and yet the gall bladder was full of bile. Anomalous cases have been reported where the portal vein, instead of passing through the liver, emptied into the ascending vena cava, and where also there was found no deficiency of bile. These facts point to the conclusion that the secretory elements of the liver have an elective power, and that this gland may elaborate its products either from venous or arterial blood. The natural color of bile is variable: in the pig it is bright yellow; in the dog, dark brown; and in the ox, greenish yellow. In general, it may be stated that it is dark green in carnivorous, and greenish yellow in herbivorous, animals. Its specific gravity is variously stated. Some authorities place it at 1026; others from 1020 to 1026; and again others from 1026 to 1031. These differences are considerable, but the numbers were probably the result of exact observation, as the bile is found to differ under different circumstances. Fresh bile is nearly inodorous, but after being taken from the body of an animal it soon undergoes putrefactive changes. It has been generally thought to be invariably alkaline, and this is true of that which is found in the hepatic duct, but it often has an acid reaction after it has passed into the gall bladder.

COMPOSITION OF THE BILE ACCORDING TO ROBIN

Water	916.00 to 819.00
Taurocholate of soda	56.50 " 106.00
Glycocholate of soda	traces
Cholesterin	0.62 to 2.66
Biliverdin	14.00 " 30.00
Lecithin Margarin, olein, and traces of soaps	3.20 " 31.00
Cholin	traces
Chloride of sodium	2.77 to 3.50
Phosphate of soda	1.60 " 2.50
Phosphate of potassium	0.75 " 1.50
Phosphate of lime	0.50 " 1.35
Phosphate of magnesia	0.45 " 0.80
Salts of iron	0.15 " 0.30
Salts of manganese	traces " 0.12
Silicic acid	0.03 " 0.06
Mucosin	traces
Loss	3.43 to 1.21
	1000.00 1000.00

The bile contains two classes of constituents, one of which consists of true secretions destined to reënter the system and perform certain functions. They contain, with other matters, some that are formed in the liver and are no doubt elaborated from materials furnished by the blood. These are the salts included in the accompanying table under the names of taurocholate and glycocholate of soda. Biliverdin, the coloring matter of the bile, is probably a mixture of different coloring principles which undergo rapid change on exposure to the air. It has some analogy to the coloring matter of the blood, and it is also, like the biliary salts, supposed to be formed in the liver. This coloring matter has intense power, and in cases of obstruction of the biliary passages will give the skin and conjunctivæ a decidedly yellow color. Like hæmoglobin, it contains a portion of iron, but the relative amount has never been ascertained. The other constituents of the bile are truly excretory, being composed of effete matter brought by the blood vessels from the various parts of the system. In this class is cholesterin, which has long been known as a constituent of the bile, whose chemical and physical characteristics were well recognized, but whose physiological relations were not understood. (See CHOLESTERIN.)

Consult: J. H. Raymond, *Manual of Human Physiology* (3d ed., Philadelphia, 1905); W. D. Halliburton, *Handbook of Physiology* (ib., 1913); W. S. Kirkes, *Handbook of Physiology*, rev. by C. W. Greene (8th Am. ed., New York, 1914); Morris and McMurrich (eds.), *Morris's Human Anatomy* (5th ed., Philadelphia, 1914). See ALIMENTARY SYSTEM.

LIVER, DISEASES OF THE. The liver is subject to a number of disorders, circulatory, inflammatory, and infectious, some of which originate in the organ itself, while others arise from disorders in other parts of the body. It is intimately concerned with the processes of assimilation and elaboration of food, and dietary indiscretions, especially if long continued, are certain to affect the health of the organ unfavorably.

Biliousness is an unscientific and inaccurate term used to designate a condition which presents the symptoms of languor, headache, dizziness, furred tongue, a tendency to constipation, with perhaps slight yellowing of the skin, and a general sense of atony, depression, and discomfort, and which is popularly supposed to be due to derangement of the liver. The underlying pathological condition is probably an active hyperæmia of the organ. It depends not upon an excessive secretion of bile, but upon some perversion of its function or its retention in the bile ducts. Moreover, most of the symptoms do not depend directly upon changes in the bile, but upon interference with digestion in the stomach and intestines, together with the development and absorption of an infinite variety of poisonous products of decomposition, many of which are muscular poisons. Normally these are not allowed to form, owing to the presence of the bile; but when this is retained in the bile ducts, its secretion is impaired, and its composition altered, by the disorder of the liver which is a reflex result of the gastric and intestinal irritation. Biliousness is best treated by careful regulation of the diet, avoiding what are called "rich foods," sweet wines, and malt liquors. Hepatic activity is to be maintained and stimulated by vigorous outdoor exercise. Massage over the region of the liver and gymnastics which contract the abdominal muscles are useful. Drugs which have an especial action on the liver (cholagogues) are given to promote the flow of bile and to overcome the constipation. Among the more important of these are mercury in the form of blue mass and calomel, podophyllin, nitromuriatic acid, and the saline purgatives. Laxative saline mineral waters may be taken in the morning. See BILE.

Acute yellow atrophy is a remarkable disease of the liver in which the gland undergoes rapid degeneration and diminishes to two-thirds or one-half its normal size. The malady is comparatively rare and occurs after severe mental emotions, and in people whose constitutions are weakened by dissipation, by syphilis, or (in women) by pregnancy. After a period characterized by indefinite gastrointestinal symptoms, such as nausea, vomiting, and irregularity of the bowels, the characteristic features of the disease appear. These consist of jaundice and marked cerebral disturbances, viz., headache and restlessness, then delirium and gradually developing coma, with convulsive twitchings towards the end. The disease is almost invariably fatal within a few days after the severe symptoms begin.

Congestion of the liver may be active or passive. Active congestion occurs in the course of fevers and must form a part of acute inflammatory processes. Passive congestion is caused by diseases of the heart or lungs, which interfere with the return of blood through the gland. A severe form of passive congestion is known as *nutmeg liver* and results from valvular disease of the heart. The organ enlarges considerably and becomes darker in color and in advanced conditions acquires a peculiar appearance of red, yellow, and white mottling.

Inflammatory processes in the liver may be acute or chronic, and comprise perihepatitis, abscess, and cirrhosis. Perihepatitis is a gradual thickening of the capsule of the liver caused usually by chronic alcoholism, syphilis, or the chronic peritonitis that sometimes accompanies Bright's disease. In some cases the thickened capsule contracts and produces marked interference with the circulation of the organ, which assumes an almost globular form. The portal circulation in particular may be obstructed, and symptoms similar to those mentioned under cirrhosis result.

Abscess of the liver arises from the introduction into it of some septic agent through the circulation or through the bile ducts and may be multiple or single. The single or solitary abscess is common in tropical countries, often follows an attack of dysentery, and is thought to be caused by the *Amœba coli*. Solitary abscesses often reach an enormous size, and the pus may make its way into the peritoneal cavity or into the pleural cavity, where it may perforate the lung and be discharged by coughing; or it may point through the skin. These abscesses are best treated by evacuating the pus by surgical means. Multiple abscesses are usually a result of pyæmia (q.v.) and are very fatal.

Cirrhosis (*κιρρός*, yellow), or chronic interstitial hepatitis, is a slow inflammation of the liver which results in an extensive growth, usually in the course of the portal canals, of a fibrous contractile tissue which compresses and destroys the secreting cells and seriously obstructs the circulation of the blood through the portal system of veins. The disease may assume two forms: hypertrophic cirrhosis, in which the organ is greatly enlarged and its surface smooth; and atrophic cirrhosis, in which the gland is reduced often to less than half its normal size, and the surface is rough or nodular ("hobnail liver") from the irregular contraction of bands of fibrous tissue. In the great majority of cases cirrhosis is caused by the excessive use of alcohol in the form of beer, wine, or spirits. The symptoms are characteristic, especially in advanced cases. Obstructive circulatory disturbances are manifested in the stomach by nausea and vomiting, sometimes of blood; in the lower intestinal tract by hemorrhoids, and in the abdominal cavity by ascites. In this form of dropsy the effused fluid may amount to three or four gallons. Jaundice is a symptom more apt to occur in the hypertrophic than in the atrophic variety of cirrhosis. The disease is very intractable, but some patients live for years in comparative comfort with proper treatment. The taking of alcohol must be stopped entirely; the diet must be light but nutritious; and the bowels kept active. When ascites supervenes, attempts are made to promote its absorption by giving diuretic and purgative drugs; but it is often necessary to draw the fluid off repeatedly by puncturing the abdominal wall. Omentopexy (Talma's operation) consists in sewing the scarified surfaces of the omentum and peritoneum to the surface of the liver with the object of establishing a collateral circulation between the portal and septemic vessels, thus relieving the liver condition and the dropsy.

Fatty liver may be the result of an excessive deposit of fat cells in the organ, in cases of general obesity, or in emaciating diseases such as phthisis, or it may be a true degeneration in which the tissue elements are replaced by fat. The latter change takes place in acute yellow atrophy (see above) and notably in phosphorus poisoning. The liver is enlarged, smooth, its edges are rounded, and it is yellowish white on section.

Amyloid or *waxy liver* occurs in association with lardaceous disease in other organs—the brain, spleen, stomach, kidneys, and intestines. It is attributed to long-standing suppuration from phthisis, syphilis, tubercular disease of the bones or joints, and to empyema. Treatment depends upon removing the cause of suppuration. See WAXY DEGENERATION.

The liver may be the seat of tuberculosis, cancer, and syphilis. Tuberculosis occurs only as a part of a general infection. (See TUBERCULOSIS, *Liver*.) In cancer the gland becomes enlarged, hard, and nodular and irregular in outline. The disease is hopeless and treatment only palliative. Syphilis of the liver may be hereditary or acquired. In the first form it occurs as an interstitial hepatitis, in the second as a gummatous deposit during the third stage of the disease. See SYPHILIS.

Hydatid cysts are found in the liver more often than anywhere else in the body. These are caused by a minute intestinal tapeworm, *Tænia echinococcus*.

Consult: J. C. Burnett, *Diseases of the Liver* (3d ed., Philadelphia, 1905); A. L. Blackwood, *Diseases of the Liver* (ib., 1907); W. H. White, *Common Affections of the Liver* (New York, 1908); H. D. Rolleston, *Diseases of the Liver, Gall-Bladder, and Bile-Ducts* (ib., 1912); J. R. McDill, *Bloodless Surgery of the Liver* (Chicago, 1912). See also CALCULUS; BILE; JAUNDICE; CIRRHOSIS.

LIVER FLUKE. See FLUKE.

LIVER FUNGUS. See Colored Plate of FUNGI, EDIBLE.

LIV'ERLEAF'. See HEPATICA.

LIV'ERMORE, MARY ASHTON (RICE) (1821–1905). An American reformer. She was born in Boston and was educated in the Charlestown (Mass.) Female Seminary, remaining for three years after graduation as a teacher of Latin, French, and Italian. She subsequently married D. P. Livermore, a Universalist clergyman (who died in 1899), and assisted him for some time in editing the *New Covenant*, a Universalist paper in Chicago. She took an active part in the antislavery and temperance movements and during the Civil War distinguished herself by her labors for the soldiers under the direction of the United States Sanitary Commission. Afterward she became prominent as a lyceum lecturer upon moral and social questions and took a very conspicuous part in the total-abstinence cause and in the woman-suffrage movement. For several years she was one of the associate editors of the Boston *Woman's Journal* (1870–71). Her publications include: *The Children's Army* (1841); *A Mental Transformation* (1848); *Pen Pictures* (1863); *What Shall we Do with our Daughters?* (1883); *My Story of the War* (1888); *The Story of my Life* (1897). With Frances E. Willard, she edited *American Women.*

LIVER OF SULPHUR, VOLATILE. See BOYLE'S FUMING LIQUOR.

LIV′ERPOOL. A county borough and city of England, geographically in Lancashire, on the right bank of the Mersey estuary, 31½ miles by rail west-southwest of Manchester, and 201 miles northwest of London (Map: England, D 3). The centre of the city is about 3 miles from the sea. Liverpool is the second port in England (after London) and the third city in population (after London and Birmingham). Seven railways enter the city, and there is a daily steamship communication with Dublin. There are four tunnels under the town in connection with the London and North-Western Railway and one in connection with the Midland Railway. A tunnel under the Mersey, 1230 yards long, opened in 1886, connects Liverpool with Birkenhead (q.v.). The city covers an area of 16,642 acres and extends in a semicircular bend along the river front, which is lined for about 7 miles by docks and basins, connected by an electric-trolley railway. In the centre is the great floating landing stage. The docks constitute one of Liverpool's most striking features. The principal streets diverge from the level ground on the river bank up the adjacent slopes, which attain a maximum altitude of 250 feet. The main arteries are the Stanley and Scotland roads, while Church and Bold streets are famed for their large and handsome stores. The modern improvement of Liverpool dates from early in the nineteenth century, and some of its public buildings are among the finest in the world. St. George's Hall, built from 1838 to 1854 with the proceeds of dock profits, occupying three and one-half acres of land, is 600 feet long and 170 feet wide. It is of the Corinthian order of architecture, and its great hall, containing one of the largest organs in the world, is used for public meetings, music festivals, organ recitals, etc.; the assize courts and other public offices are in the building. Near St. George's Hall are the Free Library and Museum, the Walker Fine Art Gallery, the Picton Lecture Hall and reference library, the Lime Street railway station, and the principal theatres. Also centrally situated are the municipal offices and the New Law Courts; other fine structures include the town hall, in Corinthian style, opened in 1754, and forming one side of a quadrangle, with the Exchange in French Renaissance occupying the other sides; the extensive customhouse in Ionic, the post office, Royal Institution, the buildings of Liverpool University, the markets, banks, insurance buildings, hotels, and several places of amusement. Of the numerous ecclesiastical buildings, St. Luke's, a fine modern Gothic church, occupies a prominent site, and St. Peter's is the pro-cathedral of the diocese. St. James's Mount is the site of the cathedral, begun in 1904 and designed to be the largest in England. There are several large and elegant squares in the east or fashionable part of the town, fine parks, and suburbs studded with the handsome mansions and private residences of the merchants and tradesmen of the city. Of the numerous monuments and statues in the city, the chief are those of Queen Victoria, Prince Albert, Nelson, Wellington, and Huskisson.

For administrative purposes, the county borough and city of Liverpool is divided into 35 wards, with 103 councilors and 34 aldermen. In 1893 the title of the chief magistrate was raised from mayor to lord mayor. The Parliamentary borough of Liverpool sends nine members to Parliament. To remedy the evil of overcrowding in the poorer quarters, old tenements have been condemned and either torn down by their owners or purchased by the city. The poorest among the working people live in underground cellars, which are highly injurious to health. The city now issues strict regulations as to their minimum size, height, position with regard to the ground, ventilation, light, etc., violation of such regulations being punished by fine. How serious the evil was may be seen from the fact that with an average city death rate of about 23 per 1000 in 1896–99, the mortality in unsanitary districts during the same period ranged from 33 to 65. The death rate in the modern artisans' dwellings built by the city was only 21. Municipal dwellings were first opened in Liverpool about 1888, accommodating 271 families and 12 shops. The city has been building ever since, the buildings differing in accommodation and size according to their location for artisans and for unskilled laborers. The former are largely three-room dwellings rented for about $6 per month, the latter one- and two-room dwellings at an average monthly rent of $1 per room. The corporation owns considerable real estate, a great part of which it has inherited from the mediæval municipality.

The water supply has long been in the hands of the city. The old supply from Rivington becoming inadequate, the corporation under an act of Parliament acquired Lake Vyrnwy in Montgomeryshire, from which it conveys the water through an aqueduct 68 miles long. The work was completed in 1872. As population increased, a further supply was needed, and the Vyrnwy River, an affluent of the Severn, was impounded; this work was completed in 1892. Subsequently the Mochnant and Conwy rivers were impounded and led by tunnels to Lake Vyrnwy, the main reservoir; the work was finished in 1910. The cleansing of the city of the sewage and garbage is carried on by the corporation under the immediate supervision of the city engineer. The material gathered is converted as far as possible into fertilizers, the rest being disposed of by combustion. The clinker remaining after combustion is broken up and made into slabs for sidewalks. Part of the sewage is conveyed to the municipal sewage farms, on which are raised crops of rye, grass, and all kinds of vegetables. These farms have been thus remuneratively managed for many years. The maintenance of municipal baths dates as far back as 1794, Liverpool having been the first city in England to provide its citizens with cheap bathing facilities. It has at present the largest and best-fitted bathing establishments in England, which are patronized by more than

1,000,000 people a year, but with the extremely low prices (one cent and upward) the city has not been able to make them self-sustaining. The losses, however, are more than offset by the profits of the municipal markets.

The entire system of docks and harbor improvements of the city is in the hands of the Mersey Docks and Harbour Board, in which are represented the three boroughs Liverpool, Birkenhead, and Bootle. On the east side of the estuary the docks have a frontage of about 6½ miles, of which about 4¼ miles are in Liverpool and the remainder in the borough of Bootle. On the Cheshire side the Birkenhead docks have a frontage of over 2 miles. The Liverpool and Bootle docks and basins have a water area of 418 acres, with a lineal wharfage of 27 miles. The Birkenhead docks have a water area of 165 acres and a lineal wharfage of 9½ miles; this includes the great Float (occupying the site of Wallasey Pool), which forms a dock of 120 acres, with a wharfage of about 5 miles. On the Liverpool side there are some 60 docks and basins, and on the Cheshire side 14; in addition, Liverpool has three graving docks, and Birkenhead three. The docks can receive the largest vessels, but, owing to the great difference of the tides, can be opened for only a short time at high water. The famous landing stage is 2478 feet long and 80 feet broad, supported by about 200 floating pontoons and connected with the river wall by eight footbridges and a floating bridge, 550 feet long and 35 feet wide, for vehicles. The system of inclosed docks was begun by the Liverpool Corporation in 1709; by the Act of 1857 the management was transferred to the Mersey Docks and Harbour Board. The Birkenhead docks, begun in 1843, were acquired by Liverpool in 1855; they are now of especial importance in the grain and cattle trade and in the export trade to the Orient. The docks on both sides of the estuary are equipped with the latest and most efficient machinery and appliances and are bordered with immense warehouses. The Herculaneum Dock in Liverpool contains a remarkable petroleum magazine made of solid rock and having a capacity of 60,000 barrels. The city acquired an electric plant in 1895, which was subsequently enlarged to provide power for the municipal tramways. The latter have been worked by the city since 1897; previously the lines were leased at a profit to a private company. Liverpool owns and maintains five hospitals for infectious diseases. In addition to several large parks, there are numerous gardens, the total area of parks and gardens being 881 acres. This does not include two parks aggregating over 200 acres owned by the city but outside the city limits. The largest of the parks is Sefton, containing 269 acres and opened in 1872.

In addition to its public schools the city subsidizes a great number of institutions for technical instruction; there are special centres of instruction for working women and girls; evening classes in commercial and technical subjects; a school of applied art; and departments of electrical engineering, hygiene, and commerce in connection with the Liverpool University. The latter, incorporated in 1903, had in 1913–14 about 1100 students. Also notable are the Liverpool College, Liverpool Institute, School of Tropical Medicine, School of Art, School of Architecture and Applied Science, St. Francis Xavier's College, Catholic Institute, and the Liverpool School of Science. There is a nautical college for the training of officers and seamen for the merchant marine. The city maintains free public libraries, which are well equipped and accessible to the people. Free lectures for working people are given in connection with that department. The museums include the Derby Museum, with zoölogical, botanical, and geological departments and an aquarium; and the Mayer Museum, containing European and Oriental antiquities and an ethnographical collection.

Liverpool's foreign trade is far more important than its industrial establishments. These include engineering works, sugar refineries, tobacco manufactories, and mills for oil pressing and making oil cake. Formerly Liverpool was famous for its shipbuilding. The city has the largest share of the British trade with America, Australia, India, Africa, and the Mediterranean countries, and is next to London as a commercial port. The growth of the port is indicated in the following table of shipping entered and cleared (foreign and colonial trade):

YEAR	Vessels	Tonnage
1801	5,060	459,719
1831	12,537	1,522,436
1861	21,095	4,977,272
1881	20,249	7,893,948
1901	20,087	12,636,225
1911	....	14,767,990
1912	....	14,699,889

Leading articles of import are cotton (85 per cent of all cotton imports into the country), flour and grain, cattle, dressed meat, raw sugar, wool, tobacco, timber, leather, etc. The chief articles of export are cotton goods, iron and steel manufactures, woolen goods, machinery, pig iron, etc. Total imports and exports in 1901 were valued at £131,557,791 and £105,808,166 respectively; in 1906, £146,701,650 and £150,348,511; in 1911, £159,914,782 and £176,524,235; in 1912, £179,250,136 and £194,115,379. In 1912 exports of domestic produce amounted to £163,725,870, and of foreign and colonial produce, to £30,389,509. Liverpool is a great shipping point of emigrants to America.

The growth of Liverpool in population has kept pace with its commercial progress. In the middle of the fourteenth century there were only about 800 inhabitants. In 1700 the population was nearly 6000; in 1760, about 25,000; in 1801, 82,000; in 1851, 375,000; in 1891, 629,548; in 1901, 684,958. The latter figure is the population of an area of 13,239 acres. The area at the 1911 census is stated at 16,642 acres; the population of this area was 704,134 on the basis of the 1901 census, and 746,421 according to the 1911 census. The parliamentary borough of Liverpool comprises 9 constituencies, aggregating 8149 acres, with 626,634 inhabitants in 1901 and 623,698 in 1911.

The name Liverpool, probably Anglo-Saxon in origin, first occurs in 1190. In 1207 King John granted certain privileges to all settlers in the place, and in 1229 it received a charter of incorporation. Before 1600 its growth was insignificant. During the Civil War it was held by the Parliamentarians, was thrice besieged, and was taken by Prince Rupert in 1644. Its commercial prosperity began after the Restoration. During the eighteenth century it grew rich in the slave trade and privateering; later it became the great emporium for American trade. The first important steam railroad in the world was opened between Liverpool and Manchester in 1830.

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LIVERPOOL. The capital of Queen's Co., Nova Scotia, Canada, and port of entry at the mouth of the Mersey River, 112 miles southwest of Halifax by rail (80 miles direct), on the Halifax and Southwestern Railway (Map: Nova Scotia, E 4). It contains the county buildings, has a good harbor, considerable shipbuilding, and a good trade in lumber and fish. It has tanneries, leather manufactures, saw and planing mills, iron foundries, granite works, pulp and paper mills, and a carriage factory. The United States is represented by a consular agent. Pop., 1901, 1937; 1911, 2109.

LIVERPOOL, Charles Jenkinson, first Earl of (1727–1808). An English statesman. He was born at Winchester, April 26, 1727, and came of a distinguished Oxfordshire family. He was educated at the Charterhouse School, London, and at University College, Oxford, graduating M.A. in 1752. In early life he published, among other works, a *Discourse on the Conduct of Government Respecting Neutral Nations*—a valuable work, which was translated into several languages. His literary ability attracted the notice of Lord Bute, whose private secretary he became. In 1761 he entered Parliament for Cockermouth, and the same year he was appointed an Undersecretary of State. Having become the leader of the King's supporters in the House of Commons, he was made Joint Secretary of the Treasury in 1763 and a Lord of the Admiralty in 1766. In 1772 he was appointed one of the vice treasurers of Ireland and in 1776 Master of the Mint. He was Secretary of War (1778–82), and his connection with the closing years of the American War gained him an unpopularity on both sides of the Atlantic, which, however, he outlived. In 1783 he was appointed by Pitt a member of the Board of Trade. In 1786 he was made Chancellor of the Duchy of Lancaster, created Baron Hawkesbury, and appointed President of the Board of Trade; in 1796 he was created Earl of Liverpool. After this he withdrew almost entirely from public life, published an able *Treatise on the Coins of the Realm* in 1805, and died in London, Dec. 17, 1808.

LIVERPOOL, Robert Banks Jenkinson, second Earl of (1770–1828). An English statesman. He was the eldest son of Charles Jenkinson. Educated at the Charterhouse School and Christ Church College, Oxford, he went in 1789 on a Continental tour, which gave him a sight of the opening days of the French Revolution. In 1790 he was elected to Parliament from Appleby and became closely connected with the Tory interests. After seven years' work as a member of the India Board, he became Foreign Secretary in Addington's cabinet in 1801, negotiating while in that position the famous Treaty of Amiens with Napoleon. After 1796 he was known by courtesy as Lord Hawkesbury and in 1803 was created Baron Hawkesbury. On the return of Pitt to power Hawkesbury became Home Secretary (1804–06). He held the same office under the Portland administration in 1807. In 1808, on the death of his father, he became Earl of Liverpool. After holding portfolios in the ministry of Perceval, he became Premier on the assassination of that statesman in 1812 and for 15 years remained at the head of English affairs. Though his administration was frequently very unpopular, he was enabled, by the union in 1812 of the old and new Tories, to obtain majorities. His ministry was criticized for the bad administration of finances, the increase of the duty on imported grain, and the reputed connivance of England in the putting down of the revolution in Naples. Liverpool was not a brilliant man, but his conservatism and steadiness helped materially to carry England safely through the enormous difficulties of the Napoleonic era and the rearrangement of affairs which became necessary thereafter. Consult: *Memoirs of the Public Life and Administration of the . . . Earl of Liverpool* (London, 1827); C. D. Yonge, *Life and Administration of Robert Banks, Second Earl of Liverpool* (ib., 1868); T. E. Kebbell, *History of Toryism* (ib., 1882).

LIVERPOOL, University of. Founded in 1881 as University College, Liverpool, it constituted a part of Victoria University from 1884 to 1903, when it was completely reorganized and given the rank of an independent university. It consists of five faculties—arts, science, engineering, law, and medicine. The university has made great progress since the reorganization and has developed in particular on the arts side. There have been introduced departments of Celtic paleography; diplomatics; social anthropology and ethnology; archæology; civic design, town planning, etc.; local history and records. The school of social science and of training for social work was unique until recently. The medical faculty has acquired a reputation through its school of tropical medicine. A strong department for university extension is conducted by the university. The number of students in 1912–13 was 1312. See Manchester, University of.

LIVER ROT, or Fluke Disease. A disease of sheep, due to the presence, in the liver and biliary ducts, of a flat worm (*Fasciola hepatica*), or fluke, which often causes very heavy losses in sheep-raising countries. It also occasionally attacks rabbits, hares, deer, and cattle. Autumn and early winter are the periods of its most frequent occurrence. Close, damp weather, inducing a rapid growth of soft, luxuriant herbage, favors its development; low, damp, marshy situations, water meadows, and undrained lands furnish a large proportion of cases, and sheep grazed upon such land, or taking a single draft from an infected, stagnant pool, may contract the disorder by swallowing the young flukes. The hay from such localities induces rot almost as readily as the fresh grass. From 15 to 40 days usually elapse before any serious consequences follow from the presence of the parasite. At first, indeed, digestion appears to be stimulated, and the sheep thrive rather better than before; but by and by they rapidly waste, their wool becomes dry and easily detached, their bowels irregular, their skin and mucous membranes yellow, as is usually conveniently observed by examining the eye and its pearly caruncle. The body, after death, is soft, flaccid, and indifferently nourished; watery effusions are discovered underneath the jaws and in other dependent parts; the small quantities of unabsorbed fat are dirty yellow; the liver is soft and enlarged and usually mottled with patches of congestion. In the thick and muddy bile the flukes, with their myriads of spawn, float in variable numbers.

The treatment of liver rot is so seldom satisfactory that if the animals, when first affected, are in tolerable condition, no time should be lost in having them slaughtered. If remedial measures are attempted, the sheep should be removed to a dry situation and liberally supplied with dry, nutritive food. During the summer feed grain with the grass; during the winter, when cases are most frequent, supply clover hay, peas, or split beans, a little bruised linseed cake, and a few roots; pieces of rock salt should also be laid about the ground for the patients to lick. Medicines are seldom of much avail. Those most to be relied on are turpentine and powdered gentian in two-dram doses, given daily, beaten up with an egg and a little milk or with some linseed gruel. The turpentine, besides acting beneficially as a stimulant, doubtless also exercises a poisonous action on the flukes, while the gentian imparts tone to the irritated and relaxed bowels. The prevention of liver rot is usually effected by removing from the land all superfluous moisture by deep and thorough drainage. Where pastures are suspected of infestation, beans and oats should for a time be fed in moderate quantity, and access allowed to rock salt. The reason for avoiding inundated or marshy localities is that the immature form of the liver fluke, after passing its preliminary stages in the bodies of water snails, attaches itself to grass and other plants in such places and thus gains entrance to the sheep along with the forage. See FLUKE; TREMATODA.

LIVERSEDGE, lĭv′ẽr-sĕj. A town in the West Riding of Yorkshire, England, 6 miles southeast of Halifax and 1 mile west of Heckmondsville. Its importance is due to its manufactures of iron, mill machinery, woolen, cotton, chemicals, and other goods. Pop., 1901, 13,980; 1911, 14,658.

LIVER SPOTS. See CHLOASMA.

LIV′ERWORT. The common name given to the representatives of one of the two great groups of Bryophytes (q.v.). See HEPATICÆ.

LIV′ERY (AF. *liverie*, *liveree*, OF. *liveree*, *livree*, Fr. *livrée*, from ML. *liberata*, delivery, from Lat. *liberare*, to deliver, set free, from *liber*, free). A word applied in its origin to the custom which prevailed under Carolingian kings of delivering habits to the members of their households on great festivals. In the days of chivalry the wearing of livery was not, as now, confined to the domestic servants. The duke's son as page to the prince wore the prince's livery, and the son of the esquire wore the livery of the knight. Cavaliers wore the livery of their mistresses. There was also a large class of armed retainers in livery attached to many of the more powerful nobles. In England this custom became such a menace to strong government that in 1390 the statute of Livery and Maintenance was passed, forbidding any one save the King to give a suit of livery. The law, however, was evaded, and the evil continued until the time of the Tudors. The livery colors of a family are taken from their armorial bearings, being generally the tincture of the field and that of the principal charge; or, where the field has two tinctures, both are taken. The royal family of England have sometimes adopted colors varying from the tinctures of the arms. The Plantagenets had scarlet and white; the house of York, murrey and blue; white and blue were adopted by the house of Lancaster; white and green by the Tudors; yellow and red by the Stuarts and by William III; and scarlet and blue by the house of Hanover. An indispensable part of the livery in former times was the badge (q.v.).

The freemen of the different trade guilds of London are called liverymen, entitled to wear the livery of their respective companies, and the companies pride themselves on the splendid appearance which their liveries make in the civic train.

LIVERY COMPANIES. See GUILD; LIVERY.

LIVERY OF SEISIN, sē′zĭn (delivery of possession). In English law, the method by which the feoffment, or ceremonial conveyance of land, was effected. It was anciently requisite in all conveyances of freehold estates, as these, being founded on an actual seisin, could not be transferred otherwise than by a transfer of the seisin. In its original and characteristic form it was an open and notorious transaction, occurring on the land, the seller, in the presence of witnesses, handing to the buyer a twig or a clod of earth, in token of the land to be conveyed. This was known as a "livery in deed." When it was not feasible to go upon the land, the same ceremony might be performed at a convenient place in view of the premises to be conveyed. Such livery, known as "livery in law," was equally valid as that performed on the land itself; but the feoffment or conveyance in that case was not complete unless the vendee entered upon the premises within the lifetime of the vendor. As livery was concerned with the transfer of the seisin, it had to do only with real property described as corporeal and not with incorporeal interests, such as easements, remainders, and the like, which could be created or transferred only by the form of deed known as a grant. The former were, accordingly, said to "lie in livery," the latter to "lie in grant." The supreme importance of seisin, as the root, if not the very substance, of title, gave a unique importance to a method of conveying lands which involved an actual transfer of the seisin. Accordingly livery of seisin had the extraordinary effect of vesting in the feoffee the estate which the feoffor purported to "create" by the transaction, even though his own possession was based upon an inferior title. Thus, a life tenant or even a leaseholder, if in possession, might, by this method of conveyance, vest in his feoffee an estate greater than his own, as a fee tail or fee simple, the conveyance operating to disseise the feoffor's landlord (reversioner) or remainderman. Because of its efficacy in thus creating an estate by wrong, livery of seisin was known as a tortious method of conveyance.

Livery of seisin no longer exists as a method of conveying real property, having everywhere been superseded by deeds of conveyance. See Conveyance; Deed; Delivery; Feoffment; Seisin.

LIVERY STABLE. An establishment where horses are kept for hire and where stabling is provided. The business of keeping a livery stable is not a public calling, like that of a farrier or innkeeper, and the keeper is not, therefore, required by law to accept the custom of any and every one who may offer his trade. On the other hand, he has at common law no lien on the horse in his custody for his charges, though in the United States such a lien has generally been accorded him by statute. Placing a horse in the custody of a livery-stable keeper constitutes an ordinary bailment, the keeper having an independent possession which he may vindicate by action of trespass against any one interfering therewith. He is liable to the owner only for negligence, i.e., for failure to exercise ordinary and reasonable care. See Bailment; Agistment; Lien.

In the United States the practice of livery-stable keepers of letting out horses of their own for hire has caused the term "livery stable" to be commonly applied to establishments carrying on this business, either in conjunction with the occupation of keeping the horses of others for hire or as an independent trade. In this case the situation of the parties is reversed—the liveryman being the bailor, and the hirer the bailee, with the right of possession and the liability for injuries resulting from negligence resting upon the latter. A person hiring a horse is held to the strict performance of his contract and is bound to use reasonable care and skill in managing and caring for him. For willful abuse of the animal or for an unauthorized use, he is liable in an action of trover as for a conversion. See Hiring; Conversion.

LIV′IA DRUSIL′LA (c.56 B.C.–29 A.D.). The wife of the Roman Emperor Augustus. She was the daughter of L. Livius Drusus Claudianus. She was married to Ti. Claudius Nero, by whom she had two sons, Tiberius (afterward Emperor) and Nero Drusus. (See Drusus, 3.) But before the birth of the latter Augustus fell in love with her, divorced his own wife, Scribonia, and compelled Livia's husband to divorce her, and married her in 38 B.C. She was in many ways a remarkable woman, and her influence over the Emperor was great. She possessed strength of character and consummate tact and strove to please the Emperor in every way. The only source of discord was the question of succession to the throne, for Livia was ambitious for her son Tiberius, and her intrigues in his behalf rendered the later years of Augustus unhappy. Scandal attached to her name, and the suspicion was roused that the death of the Emperor's grandsons, Gaius and Lucius, the logical heirs, was brought about by the contrivance of Livia. Augustus, left without male descendants, was forced to adopt Tiberius in his will. He died in 14 A.D., leaving the request that Livia be adopted into his *gens* and be called Julia Augusta. Tiberius now became Emperor, but Livia continued to act as his guardian even in state matters, being unwilling to lose the power and influence she had gained. This proved excessively distasteful to Tiberius, who conceived a growing dislike for her, and, when she died at an advanced age in 29 A.D., made no concealment of his satisfaction at her death. Consult "Livius, 10," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

LIVII, lĭv′ĭ-ī. A Roman *gens* (q.v.), of plebeian rank but great influence and power. The earliest consul from the *gens Livia* was Marcus Livius Denter, consul in 302 B.C. The later history of the family is closely bound up with the history of the Empire. (See Livia Drusilla; Drusus.) The cognomina (see Cognomen) of the *gens* are Denter, Drusus, Libo, Macatus, and Salinator. The last of these was first given to Marcus Livius, who imposed a tax on salt in his censorship. As consul with Æmilius Paulus in 219 B.C., he shared in the triumph after the Illyrian War, but was condemned for having unfairly divided the spoils. But he was consul again in 207, and in that year commanded, jointly with the consul Gaius Claudius Nero, his political opponent, the army which defeated Hasdrubal at the Metaurus. (See Hasdrubal, 3.) In 205 he was proconsul in Etruria and penned up the Carthaginian Mago in Liguria; he was censor in the following year, with Nero, his old enemy and colleague, in the consulate, and the two quarreled bitterly.

A Livius Drusus in 54 B.C. was defended by Cicero from the charge of betraying a case he was to prosecute and was acquitted. He may possibly have been the Livius Drusus Claudianus, father of Livia Drusilla and originally of the Claudian Gens, who sided with the liberators (Brutus, Cassius, etc.) and committed suicide after Philippi (42 B.C.). See "Livius," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

LIVING FISH. A name in China, translating "lang ya," for various walking fishes (see Walking Fish), so called because they are "carried about in tubs and sold in pieces cut from the fish when alive."

LIV′INGSTON. A seaport of Guatemala, situated at the mouth of the Dulce, on the Gulf of Amatique (Map: Central America, C 3). It is a port of transit for the town of Izabal (q.v.), situated at the head of Lake Izabal, of which the Dulce is the outlet, the river not being navigable for large vessels. The town exports coffee, cabinet woods, and tropical fruits, especially bananas, the trade being chiefly with the United States. It is the seat of a United States consular agent. Pop., 2000.

LIVINGSTON. A city and the county seat of Park Co., Mont., 123 miles southeast of Helena, on the Yellowstone River, and on the Northern Pacific Railroad and its National Park branch (Map: Montana, F 4). It is a railroad division headquarters, and, besides extensive machine shops, roundhouses, etc., has lumber mills and lime works, and an important trade in live stock, wool, gold, coal, and coke. The city is of note also as a centre for sportsmen, the adjacent region affording good hunting and fishing. Among the features of the place are the Northern Pacific Railroad depot, Carnegie library, fine Federal building, and county high school. Pop., 1900, 2778; 1910, 5359.

LIVINGSTON, BURTON EDWARD (1875–). An American plant physiologist, born at Grand Rapids, Mich. He was educated at the University of Michigan (B.S., 1898) and at the University of Chicago (Ph.D., 1902), where he was fellow and assistant between 1899 and 1905. In 1905–06 he served as soil expert for the United States Bureau of Soils and for the next three years was engaged in botanical research at the Carnegie Institution, Washington. He became professor of plant physiology in 1909 and director of the laboratory of plant physiology in 1913 at Johns Hopkins University. He published *Rôle of Diffusion and Osmotic Pressure in Plants* (1903) and contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA.

LIVINGSTON, EDWARD (1764–1836). An American jurist and statesman, born May 26, 1764, at Clermont, Columbia Co., N. Y. He graduated in 1781 at Princeton, studied law at Albany and New York, was admitted to the bar in 1785, and rose rapidly to high rank in his profession. From 1795 to 1801 he was a member of Congress, where he supported the measures of the Republican party and attracted attention, particularly by speeches against the Alien and Sedition Laws, on the resolution calling for the correspondence relative to the Jay Treaty, and on the conduct of President John Adams in the case of Jonathan Robbins. In 1801 he was appointed United States Attorney for the district of New York, and during the same year was elected mayor of the city of New York. Through the dishonesty of a clerk in the district attorney's office, Livingston's affairs soon became seriously embarrassed, with the result that he was found to be considerably behind in his accounts. Upon discovering the conduct of his agent Livingston voluntarily confessed judgment for $100,000, resigned his office, and prepared to leave New York. The exact amount of the shortage was something over $43,000. It was not until 1826 that a final settlement with the United States was made. The amount of the shortage with the accrued interest had then reached $100,000, every dollar of which Livingston paid. His resolution to abandon the State was unshaken, and he could not be persuaded to reconsider his decision. In December, 1803, he sailed for New Orleans, and early in 1804 became a member of the bar there. Louisiana had just been acquired by the United States, chiefly through the diplomacy of his brother, Robert R. Livingston, and a great future seemed to await men of Livingston's talents in that country. The legal system of Louisiana was a strange mixture of Spanish and French law, having its foundation in the *Corpus Juris Civilis* of the Romans. In spite of this difficulty he soon had a lucrative practice, and, by accepting land for his fees, acquired the basis of a respectable fortune. During the second war with Great Britain he was active in rousing the population of New Orleans to resistance and served for a time as secretary and confidential adviser to General Jackson. In 1820 he was elected to the Lower House of the Louisiana Legislature, and with two other members was commissioned to prepare a civil code for the State. Their draft, largely the work of Livingston, was adopted, in large part, by the Legislature in 1825. In the year 1821 he was selected by joint ballot of the Legislature to revise the entire system of criminal law of the State. For this task he possessed preëminent qualifications, having studied with great care the legal systems of Rome, France, Spain, and Great Britain. After about three years of labor he had finished a complete system of penal law, divided into codes, books, chapters, sections, and articles. Unfortunately, just as the final draft of the code was completed, it accidentally caught fire and was completely destroyed. Undaunted by this misfortune, he again began the work, and within two years it was again completed. The code was marked by liberal and enlightened principles and contained provisions looking towards a more humane penal system. The work was styled *A System of Penal Law,* and was divided into a Code of Crimes and Punishments, a Code of Procedure, a Code of Evidence, and a Code of Reform and Prison Discipline, besides a Book of Definition. The system which Livingston prepared was never directly adopted as a whole by the State, but its publication gave him fame throughout America and Europe, and many of its principles were incorporated in the legal systems of other States of America, and even in those of certain European countries, while the Government of Guatemala adopted his Code of Reform and Prison Discipline without change. In connection with this code Sir Henry Maine characterized Livingston as "the first legal genius of modern times." In 1822, while still engaged in the revision of the Louisiana legal system, Livingston was elected to Congress. He was twice reëlected, serving until 1829, when he was transferred to the United States Senate, where he took high rank. In 1831 President Jackson appointed him Secretary of State. In this capacity he prepared a number of state papers for the President, the best known being the antinullification proclamation of Dec. 10, 1832. In 1833 the President sent him as Minister Plenipotentiary to France to demand the payment by the French government of an indemnity of a million sterling on account of depredations upon American commerce. He was entirely successful in this mission and returned to the United States in 1835, settling on his estate, Montgomery Place, on the Hudson, where he died the following year. His works on *Criminal Jurisprudence,* in two volumes, were published in New York in 1873. Consult C. H. Hunt, *Life of Edward Livingston* (New York, 1864), and Carleton Hunt, *Life and Services of Edward Livingston* (New Orleans, 1903).

LIVINGSTON, HENRY BROCKHOLST (1757–1823). An American soldier and jurist, son of William Livingston. He was born in New York City and graduated at Princeton in 1774. Upon the breaking out of the Revolutionary War he entered the Patriot army, served as an aid on Benedict Arnold's staff, with the rank of major, in the operations against Burgoyne, and later received the rank of lieutenant colonel. In 1779 he went to Spain as secretary to John Jay, his brother-in-law, and was taken prisoner on the return voyage in 1782 by the British, but was soon released. He then studied law under Peter Yates, was admitted to the bar in 1783, and quickly became prominent in his profession. In 1802 he was made a judge of the New York Supreme Court and in 1807 associate justice of the United States Supreme Court, which latter office he held until his death. He is generally known merely as Brockholst Livingston.

LIVINGSTON, LUTHER SAMUEL (1865–1914). An American bibliographer. He was born at Grand Rapids, Mich., and for a time was employed in a bookstore there. Later he was connected with the rare book department of Dodd, Mead, and Company, New York City. In 1910 he formed with Robert H. Dodd the firm of Dodd and Livingston, but retired from the partnership in 1913 on account of ill health. He died at Cambridge, Mass. In 1903 he edited reprints with prefatory notes of the original editions of Milton's *Comus*, Hariot's *Virginia*, and Brereton's *Virginia*. In 1912 he printed some hitherto unpublished poems of Robert Louis Stevenson, and in 1914 compiled *Franklin and his Press at Passy* (France). He also edited from 1895 until 1914 the annual *American Book Prices Current: A Record of Books, Manuscripts, and Autographs Sold at Auction*, and from 1905 *Auction Prices of Books;* and he prepared bibliographies of first editions of Tennyson (1901), Charles and Mary Lamb (1903), Longfellow (1908), Lowell (1914), Kipling, etc.

LIVINGSTON, Peter van Brugh (1710–92). An American merchant, born in Albany, N. Y., the son of Philip, second Lord of Livingston Manor. He graduated at Yale in 1731, settled in New York City, where he became a wealthy merchant in partnership with his brother-in-law, William Alexander (Lord Stirling), and built a large mansion on what is now Hanover Square. He was a leading Presbyterian and was one of the founders in 1746 of the College of New Jersey, at Elizabethtown, N. J., which afterward became Princeton College. For many years previous to the Revolution he was a member of the New York Provincial Council. During the larger part of the period between 1759 and 1774 he was active in the Revolutionary cause, quietly but effectively promoting resistance to the mother country. In 1759 he was a member of the Council of Ten, and he was also a member of the Committee of One Hundred. In 1760 he joined the Sons of Liberty, and he became one of the leading spirits of that organization. On April 22, 1774, he was one of a party who, disguised as Mohawks, like their Boston compatriots, threw overboard a cargo of tea brought by the *Nancy* into the harbor of New York. He was President of the First Provincial Congress of New York (1775) and a delegate to the Second (1775–76). He enjoyed the friendship of Washington, and on more than one occasion was consulted by him. It was at his country place at Dobbs Ferry that General Washington, Governor Clinton, and Sir Guy Carleton met to settle matters connected with the evacuation of New York City by the British forces. After the adoption of the new State Constitution in 1777 he was elected to the Legislature and was chosen President of the Lower House. From 1776 to 1778 he was Treasurer of the Continental Congress.

LIVINGSTON, Philip (1716–78). A signer of the Declaration of Independence and a brother of Peter van Brugh Livingston. He was born in Albany, N. Y., and, graduating at Yale in 1737, became a successful merchant in New York City. There he was a member of the City Council, served in the Colonial Assembly in 1759–69, and was Speaker in 1768. An ardent supporter of the Patriot cause, he was a delegate to the Stamp Act Congress (1765), represented New York in the Continental Congress in 1774–78, was a member of the New York State Senate in 1777–78, and signed the Declaration of Independence. Livingston helped to found the New York Chamber of Commerce and was a benefactor of Yale and of King's (later Columbia) College.

LIVINGSTON, Robert (1654–1725). An American colonist, the founder of the Livingston family in America. He was born at Ancrum, Scotland, the son of John Livingston, a Scottish Presbyterian clergyman, who was banished and settled in Rotterdam, Holland, in 1663. There Robert was educated by his father, after whose death he emigrated to Charlestown, Mass., about 1673. Beginning in 1686, he was awarded grants to Livingston Manor, including the major part of what are now Dutchess and Columbia counties, bordering on the Hudson River, in New York. The royal charter confirming these grants conveyed the privileges of court leet, court baron, and advowson. In 1675 he removed to Albany, N. Y., where he was appointed Secretary of the Board of Indian Commissioners. He also served as town clerk and as a member of the Colonial Assembly (1711–15, 1716–17) and its Speaker (1718–25). In 1701 he proposed a plan for grouping the English Colonies in America into "three distinct governments" for administrative purposes. Consult Livingston, *The Livingstons of Livingston Manor* (New York, 1910). See Livingston Manor.

LIVINGSTON, Robert R. (1746–1813). An American jurist and statesman, brother of Edward Livingston. He was born in the city of New York, Nov. 27, 1746, graduated at King's (now Columbia) College in 1765, studied law, was admitted to the bar in 1773, and for a time was associated in the practice of his profession with John Jay. In the same year in which he was admitted to the bar he was appointed by the crown to the position of recorder of the city of New York, a judicial office which he was compelled to relinquish two years later on account of his avowed sympathy with the Patriot party. In the following year he became a member of the Continental Congress and served on the committee appointed to draw up the Declaration of Independence, which document, however, he did not sign, owing to his withdrawal from Congress to attend the meeting of the Provincial Convention of New York. Later in the Revolution he served another term in the Congress (1779–81). He was a member of the committee which drafted the constitution of the State of New York in 1777, and upon its adoption became the First Chancellor of the State, an office which he filled with distinction until 1801. It was in this capacity that he administered the oath of office to Washington on the occasion of his first inauguration to the presidency, in New York City. While serving as Chancellor of New York, he was appointed Secretary of the new Department of Foreign Affairs, created by Congress in 1781—a position which he held until 1783, when he was succeeded by John Jay. He was President of the New York Convention of 1788, which was called to take action with regard to the Federal Constitution, and used his influence to secure the ratification of that instrument. In 1794 President Washington tendered him the post of Minister to France, which he declined; but in 1801, upon receiving a second tender of the same office, he accepted, and began the negotiations for the purchase of Louisiana, which, with the assistance of Monroe, were carried to a successful conclusion. He was associated with Fulton in the application of steam to navigation; gave much attention to the practice of scientific agriculture, publishing an *Essay on Agriculture* (1809) and an *Essay on Sheep* (1809); introduced the merino breed of sheep into western New York and was instrumental in introducing the use of gypsum as a fertilizer. He served on a commission to adjust the boundary of New York State and for a time was president of the American Academy of the Fine Arts, of which he was one of the principal founders. Consult Frederic De-Peyster, *Biographical Sketch of Robert R. Livingston* (New York, 1876), and J. L. Delafield, *Chancellor Robert R. Livingston of New York and his Family* (Albany, 1911).

LIVINGSTON, William (1723–90). An American lawyer and patriot, Governor of New Jersey from 1776 to 1790. He was born at Albany, N. Y., the son of Philip, the second Lord of Livingston Manor. He graduated at Yale in 1741 and studied law in New York City, where he was admitted to practice in 1748, and where in a few years he became one of the leading lawyers. In 1760 he purchased a large estate at Elizabethtown, N. J., where he built a mansion, which he named Liberty Hall. He was known as "the Presbyterian lawyer" and ardently opposed the institution of Episcopal dioceses in America in the *Independent Reflector,* a weekly paper which he established in 1752. He was president of the Moot, a famous law club in New York, and was a frequent contributor to the *American Whig* and the author of numerous able pamphlets defending the rights of the Colonies. In 1772 he gave up most of his law practice and retired to his New Jersey estate. With the exception of three terms in the New York Provincial Legislature as representative of his brother Philip's manor, he had no public office until his election to the Continental Congress in 1774. At first much opposed to the idea of separation from the mother country, he became convinced at last that that was the only possible course and championed it with enthusiasm. He was reëlected to the Second and Third Congresses, and in June, 1776, was made commander in chief of the New Jersey militia. In August, 1776, he was elected Governor of New Jersey, and, resigning his military command, remained in office until his death. Throughout the war his services were of the greatest value to Washington and the American cause, and he ranks as one of the most efficient of the "war governors" of the Revolution. He was a member of the convention which drew up the Constitution of 1787 and signed that document. With William Smith, Jr., he prepared a *Digest of the Laws of New York, 1691–1762.* Consult Theodore Sedgwick, Jr., *Life and Letters of William Livingston* (New York, 1833).

LIVINGSTONE, lĭv′ĭng-ston, David (1813–73). A famous missionary and explorer, born at Blantyre in Lanarkshire, Scotland, March 19, 1813. At the age of 10 he began work in a cotton factory and spent some 10 years as an operator, educating himself by private study and attending an evening school. In this manner he gained some knowledge of Latin and Greek and finally, after pursuing a course in medicine at Anderson College, Glasgow, and listening to the theological lectures of Dr. Wardlaw, professor of theology to the Scottish Independents, he offered his services to the London Missionary Society, by whom he was ordained as a medical missionary in 1840 and sent to South Africa, where he commenced his labors among the natives of Bechuanaland and the vast regions to the north. He secured the friendship and coöperation of the native chiefs, planted posts far beyond the civilized frontier, and systematically studied the languages and customs of the natives in order to establish a method of utilizing their efforts for their own civilization. In 1849 he pushed northward far beyond the Tropic of Capricorn and on August 1 discovered Lake Ngami. Continuing his explorations the following year, with his wife and children, he discovered the Zambezi River and reached Cape Town in April, 1852. After exploring the upper course of the Zambezi he struck out westward and in 1854 reached Loanda on the Atlantic Ocean. He then made his way back to the Zambezi and achieved the traverse of the continent by following that stream to its mouth in the Indian Ocean, which he reached in 1856. On this journey he discovered the Victoria Falls, the grandest cataract in the Old World. From Quilimane he sailed, in the beginning of 1856, for England, where he was overwhelmed with honors. In 1857 Livingstone published his *Missionary Travels and Researches in South Africa.* In the same year he severed his connection with the London Missionary Society and in 1858 was appointed British Consul at Quilimane for the East Coast of Africa and also commander of an expedition to explore East and Central Africa. He ascended the Shire, the lowermost of the large affluents of the Zambezi, and discovered Lake Shirwa and Lake Nyassa (Sept. 16, 1859). A narrative of the discoveries, *The Zambesi and its Tributaries,* was published during a visit paid to England in 1864–65. In the latter part of 1865 Livingstone returned to Africa to organize an expedition to discover the true source of the Nile and to labor for the suppression of African slavery. Early in 1866 he started for the interior by way of the Rovuma, and nothing was heard of him for two years. Livingstone's problem was, then, to determine whether the Zambezi joined the Nile or was a tributary of the Congo. At the beginning of 1867 he came to the Chambezi, a stream traversing in a southwesterly direction the region south of Lake Tanganyika, the end of which great body of water he reached in April, 1867. In his endeavors to penetrate farther into the continent he was continually thwarted by inundations, by the hostility of the slave dealers—both native and Arab—and by the want of supplies, which were constantly delayed and plundered. He nevertheless pressed on, discovered the Luapula (1867) and Lakes Mweru and Bangweolo. He arrived at Ujiji on Lake Tanganyika in 1869, where he remained for some time before setting out on an extended exploration of the region to the west of the northern part of that lake. In 1871 he stood on the shores of the Congo at Nyangwe, but his previous explorations had not covered the ground sufficiently to admit of his being assured that the stream before him must be the Congo. Returning to Ujiji amid great privations and sufferings, he was (Nov. 10, 1871) met by a relief party, under H. M. Stanley, sent out by James Gordon Bennett, of the New York *Herald.* Livingstone renewed his stock of medicines and supplies, and, after exploring the northern end of Lake Tanganyika with Stanley, he parted from him in March, 1872, and proceeded to continue his explorations in the Luapula-Lualaba basin, hoping to solve the Nile-Congo problem. The great explorer was exhausted by continued hardship and privation and died on May 1, 1873, at the village of Tshitambo, a friendly chief, on the shore of Lake Bangweolo. His native followers cut out his heart and buried it at the foot of the tree beneath whose branches he died, cutting a rough inscription on the trunk to mark the spot. In 1898 Mr. Sharpe, the British administrator for this district, visited the spot and observed that the tree was rapidly decaying. He raised a subscription in England and procured a substantial stone monument, which now marks the spot. The section of the tree containing the inscription was cut out and sent to the rooms of the Royal Geographical Society in London, where it is preserved. The body was taken to England, and on April 18, 1874, was buried in Westminster Abbey.

Livingstone's work in exploration is marked by rare precision and by a breadth of observation which will forever make it a monument to the name of one of the most intrepid travelers of the nineteenth century. His activity embraced the field of the geographer, naturalist, and benefactor of mankind, and it can justly be said that his labors were the first to lift the veil from the "Dark Continent."

Bibliography. Besides the works above mentioned by Livingstone, there was published, in 1874, *The Last Journals of David Livingstone, from 1865 to his Death*, edited by Horace Waller (London). For other accounts, consult: *Journal and Proceedings of the Royal Geographical Society*, vols. xx, xxii, xxiv–xxvii, xxxi, xxxiii, xxxiv, xxxvii, xxxviii (London, 1850–75); W. G. Blaikie, *Personal Life of David Livingstone* (New York, 1882); H. H. Johnston, *Livingstone and the Exploration of Central Africa* (London, 1897); Thomas Hughes, *David Livingstone*, in "Men of Action Series" (ib., 1901); T. B. Maclachlan, *David Livingstone*, in "Famous Scots Series" (Edinburgh, 1901); Sir H. M. Stanley, *Autobiography*, edited by Dorothy Stanley (Boston, 1911); id., *How I Found Livingstone* (New York, 1913); A. Z. Fraser, *Livingstone and Newstead* (London, 1913); Alexander Galt, "Livingstone Centenary Exhibition at the Royal Scottish Museum," in *Scottish Geographical Magazine*, vol. xxix (Edinburgh, 1913); C. S. Horne, *David Livingstone* (New York, 1913); Harry Johnston, "David Livingstone: A Review of his Work as Explorer and Man of Science," in *Scottish Geographical Magazine*, vol. xxix (Edinburgh, 1913).

LIVINGSTONE RIVER. A name applied to the Congo River (q.v.).

LIVINGSTON MANOR. A tract of land in New York State, east of the Hudson River, and occupying the northern part of the present Dutchess County, acquired by Robert Livingston about 1674. The title was confirmed by patent by Governor Hunter in 1715, at which time the tract was computed to cover 160,240 acres. In 1752 the third proprietor, Robert Livingston, was disturbed by the encroachments of Massachusetts and complained to Governor Clinton, after which the settlement of the State boundaries secured the quiet possession of the manor until 1795. In that year efforts were made by the tenants to have the title declared invalid, and in 1844 the tenants petitioned the Legislature to set aside the grant. Both attempts were unsuccessful, but were accompanied by so much disturbance that the owners, to avoid annoyance, gradually permitted the greater part of the lands to be acquired by individual holders. Consult "Papers Relating to the Manor of Livingston" in the *Documentary History of the State of New York*, vol. iii (Albany, 1850).

LIV'IUS AN'DRONI'CUS. The pioneer in Roman dramatic and epic poetry. (See LATIN LITERATURE.) He was a Greek by birth, who was brought to Rome as a prisoner of war from Tarentum, after the close of the war waged by the Tarentines, aided by Pyrrhus, against Rome. He lived about 290–205 B.C. At Rome he became a slave of a Livius, who afterward freed him; from him Andronicus derived his name (*nomen*, q.v.) *Livius*. He learned Latin and became a teacher and author. He translated the *Odyssey* into Latin Saturnian verse and wrote tragedies, comedies, and hymns after Greek models. Mere fragments are extant, of which a collection may be found in Düntzer, *Livii Andronici Fragmenta Collecta et Illustrata* (Berlin, 1835); Baehrens, *Fragmenta Poetarum Romanorum* (Leipzig, 1886); Ribbeck, *Scœnicæ Romanorum Poesis Fragmenta* (ib., 3d ed., 1897–98); Wordsworth, *Fragments and Specimens of Early Latin* (Oxford, 1874); C. Zander, *Versus Italici Antiqui* (Lund, 1890). Though not in any sense a great writer, Livius deserves more credit than is usually accorded to him; it took no slight courage to attempt to reproduce Greek works in the crude Latin of his time. (See LATIN LANGUAGE.) Even such limited success as he achieved proves that his abilities were far from small. Consult: Martin Schanz, *Geschichte der römischen Litteratur*, vol. i (3d ed., Munich, 1907); J. W. Duff, *A Literary History of Rome* (New York, 1909); Friedrich Leo, *Geschichte der römischen Literatur*, vol. i (Leipzig, 1913).

LIVIUS DRUSUS, lĭv'ĭ-ŭs dro͞o'sŭs. See DRUSUS.

LIVNY, lyĕv'nĭ. The capital of a district of Livny, in the Government of Orel, Russia, situated on the Sosna, 95 miles southeast of Orel (Map: Russia, E 4). It has a Realgymnasium, two libraries, and a municipal bank. Its chief products are leather, tallow, soap, flour, and tobacco. Grain is the principal article of trade. Livny was founded in 1586. Pop., 1897, 20,600; 1912, 23,700.

LIVONIA, lĭ-vŏ'nĭ-ȧ (Ger. *Livland*). A government of western Russia, the middle one of the three "Baltic provinces" (q.v.), bounded by the Government of Esthonia on the north, St. Petersburg (between which and Livonia is Lake Peipus), Pskov, and Vitebsk on the east, Courland on the south, and the Gulf of Riga and the Baltic on the west (Map: Russia, C 3). Area, 17,574 square miles, of which the islands of Oesel, Mohn, Runö, etc., occupy 1096 square miles. The portion of Livonia west of the Virtz-yärvi (*yärvi*, lake) along the Gulf of Riga is flat and rather low. The eastern part of the province is mainly hilly and reaches in its highest point, Munna Mäggi (which also is the highest point of the Baltic provinces), an altitude of 1060 feet. This part of Livonia is noted for its picturesqueness. It abounds in lakes and is traversed by numerous rivers, the most prominent of which are the Aa, the Düna (which marks part of the southern boundary), the Pernau, and the Embach. There are more than 600 lakes in Livonia, of which Virtz-yärvi (106 square miles) is the largest; about one-tenth of the country consists of marsh and peat bog, and it is estimated that over one-fourth of the area is under forest. The climate is rather severe, raw, and foggy. Agriculture and stock raising are the leading industries, but the agricultural conditions in Livonia differ greatly from those prevailing in other parts of Russia. The feudal system introduced by the German conquerors practically came to an end in 1819 when the serfs of the province were emancipated by the Russian government but not endowed with land (as was subsequently the case in the rest of Russia), for the land was granted in perpetuity to its ex-feudal possessors. As a result of this arrangement, the larger part of the agricultural land of the province is in large estates owned by the nobility; the remainder is divided between the state, Church, and the smaller landholders. The large estates are worked by the most modern methods; excellent stock is raised on a large scale for both slaughtering and dairying; the dairy products are exported to a considerable extent. The principal crops are rye, barley, oats, flax, and potatoes. The manufactures are trimmed lumber, wagons, rubber articles, oil, paper, iron products, chemicals, tobacco products, etc. The centre of industrial activity is Riga (q.v.), the capital and chief port. The population, estimated at about 622,000 in 1816, was returned at 1,299,365 by the census of 1897. As calculated for the beginning of 1912 it had increased to 1,479,700. Of the inhabitants in 1897, 43.4 per cent were Letts, 39.9 per cent Esthonians, 7.6 per cent Germans, 5.4 per cent Russians, 2 per cent Jews, and 1.2 per cent Poles. Protestants (Lutheran) constituted 79.8 per cent, Orthodox 14.3 per cent, and Roman Catholics 2.3 per cent. The population of the cities is made up largely of Germans, with some Russians and Jews. Dorpat (Yuriev) is the seat of a famous university. Livonia was conquered by the Teutonic Knights and the Knights Swordbearers in the thirteenth century. When the power of the Knights Swordbearers was broken by the onslaughts of the Russians, their grand master ceded Livonia to Lithuania (q.v.). Early in the seventeenth century Gustavus Adolphus of Sweden overran and conquered the country, but it was not until 1660 that it was definitively relinquished by Poland in the Peace of Oliva. At the beginning of the eighteenth century Peter the Great of Russia wrested Livonia from Sweden, which formally renounced its possession in 1721. In recent times the Russian government has been pursuing a relentless course of Russification in Livonia. Consult: Eduard Winkelmann, *Bibliotheca Livoniæ Historica* (2d ed., Berlin, 1878), and Ernst Seraphim, *Geschichte von Livland* (Gotha, 1906).

LIVORNO, lē-vôr′nō. The Italian name for Leghorn (q.v.).

LI′VRE, *Fr. pron.* lē′vr′ (OF., pound). The name of an ancient French coin. There were livres of different values, the most important being the *livre tournois* (of Tours), which was considered the standard, and the *livre parisis* (of Paris), which was equal to a livre tournois and one-fourth. In 1795 the livre was superseded by the franc (80 francs = 81 livres tournois.—LIVRE was also the ancient unit of weight, the earliest recorded being the *livre esterlin* of Charlemagne and amounting to 5666¼ grains, or 367.128 grams. It was reputed to be based on an Arab standard, a yusdruma, sent to Charlemagne by the caliph Al Mamun. Later the *livre poids de marc* of 16 ounces was derived from this standard of Charlemagne by King John the Good. There was also a *livre de Troyes*, or troy pound. The ancient livre, equal to 489.50585 grams, persisted in France until the development of the metric system (q.v.), when the kilogram supplanted it.

LIVS, or **LIVO′NIANS**. A Finnish tribe, formerly living in Esthonia and north Livonia, now nearly extinct, holding only a narrow strip of forest land along the Baltic at the north point of Courland. They were supplanted by the Letts (q.v.). They are classed with the Baltic Finns and probably number less than 2000. Their language has nearly disappeared and the people speak a Lettish patois.

LIVY, lĭv′ĭ (59 B.C.–17 A.D.). The great Roman historian, Titus Livius, is without a history, for we have no ancient biography of him, and very little information about him is obtained either from his own writings or from allusions in other authors. He was born at Patavium (Padua), the chief city of Venetia, in 59 B.C. (a date given in St. Jerome's *Chronicle of Eusebius*), consequently at the beginning of the most important period of Roman history, for Cæsar had just obtained the government of Gaul. The place and period of his birth had great influence upon his career. Padua was a city of considerable importance, with a traditional history going back to Antenor, and Livy, a Paduan at heart, felt deep sympathy with the municipalities which preserved the old independent spirit of Italy; nevertheless he was in a larger sense a Roman and recognized the advantage of association with a people who had conquered the early enemies of his native town, and who were his fellow citizens, the Paduans having long possessed the Roman franchise. On the evidence of some inscriptions (*Corpus Inscriptionum Latinarum*, v, 2865, 2975) and of the general aristocratic spirit of his writings there is reason to believe that he belonged to a noble family; the fact that he was able to devote all his time at Rome to writing proves, further, that he had ample means. He undoubtedly received thorough training in philosophy, rhetoric, and literature, and was well versed in the Greek language and Greek literature.

When Cæsar was slain and Cicero gave voice to his Philippics, Livy was 15 years of age. He was familiar, then, with the great struggle for liberty, and with all the events of that stirring time, and in consequence was a republican. He came to Rome about 31 B.C., the year of the battle of Actium, and there he resided until shortly before his death. Although he formed a friendship with Augustus (whom, however, he mentions only twice, once to give a date and once to prove a fact), he admired Brutus and Cassius, nevertheless, and dared to say that it was a question whether or not Cæsar had been of service to his country. Augustus called him a Pompeian, perhaps in a spirit of pleasantry, as the purpose and aim of the historian must have been satisfactory to him; for while Livy idealized the Republic, he was entirely satisfied with the existing Imperial government.

Suetonius (*Claudius*, 41) remarks that Livy advised the future Emperor Claudius to write history, and that Caligula (*Caligula*, 34) called him a verbose and negligent historian. Caligula's accusation was undoubtedly due to Livy's evident ignorance of military detail and of Roman law, which resulted in errors in his description of wars and of constitutional changes. He, however, had a great reputation in his own day, of which he himself was cognizant; for he is said to have declared that he had obtained sufficient glory, but continued writing because he should miss the employment. Pliny the Younger, *Epistles*, ii, 3, tells a pleasing tale of a Spaniard who came all the way from Gades (Cadiz) to see Livy, and having seen him went home content. After the accession of Tiberius, Livy returned to Padua, where he died in 17 A.D. In the letters of Seneca (100, 9) there is a reference to dialogues, half philosophical and half rhetorical, by Livy, and Quintilian (x, 1, 39) and Seneca the Elder mention a letter addressed to his son, in which he urged him to study the speeches of Demosthenes and Cicero; but these have disappeared. His history of Rome was begun early in his life, for in book i, 19, we have a reference to the fact that the temple of Janus had been shut twice since the time of Numa—once after the First Punic War, and again after the battle of Actium; the third closing occurred in 25 B.C., so that the writing of the first book must fall between 29 and 25 B.C., and as Livy also uses here the title Augustus, which was conferred in January, 27 B.C., we may place the date about 26 B.C. In ix, 18, there is no reference to the recovery by Augustus of Crassus's standards in a passage where such reference would have been natural had Livy been writing the ninth book as late as 20 B.C. There is also evidence that the work did not appear as a whole, but in sections which contained a varying number of books. Certain passages are clearly prefaces to new parts of the history, e.g., at the beginning of books vi, xxi, and xxxi. It is noticeable that book v ends with the burning of Rome by the Gauls, so that book vi begins a new epoch; also book xvi begins the First Punic War, and book xxi the Second Punic War. These facts have led to a theory of a publication by decades or semi-decades, but it is doubtful if Livy held to this arrangement, for in the best manuscripts we find that books cix–cxvi are treated in one periocha, or summary, under the title *Bellum Civile*.

The division into decades is first mentioned about the close of the fifth century and is probably the work of copyists. The entire work consisted of 142 books, of which 35 are extant, the first (to 293 B.C.), third, fourth, and half of the fifth decade (218–217 B.C.). We have a few fragments obtained from such writers as Servius, Valerius Maximus, and St. Augustine, and a page or so from book xci, preserved in a Vatican palimpsest; this fragment was discovered in 1772. We have also from some unknown authors epitomes, *periochæ* or *argumenta*, of all the books except cxxxvi and cxxxvii. Some fragments of an epitome previously unknown were discovered by Grenfell and Hunt at Oxyrhynchus: for these, see *Oxyrhynchus Papyri*, iv (London, 1904); Kornemann, *Die neue-Livius-Epitome aus Oxyrhynchus* (Leipzig, 1904), an edition with commentary; C. H. Moore, "The Oxyrhynchus Epitome of Livy in Relation to Obsequens and Cassiodorus," in *American Journal of Philology*, vol. xxv (New York, 1904). The epitomes show that the last year recorded was 9 B.C., and this seems to indicate that Livy did not finish his history, as the event of that year, the death of Drusus, was not of sufficient importance to form the conclusion of a great work. The title of the work was probably *Ab Urbe Condita Libri*, as this is given in the best manuscripts and by the grammarians, but it is true that Livy began with Æneas, and also that he speaks loosely of his *Annales* (43, 13, 2). In his preface, however, he declares that he wrote from the beginning of the city, and Pliny, in his preface to the *Natural History*, repeats this statement. Again, the term *annales* is general in its application, and, if Livy had used it as a title, Servius, who discussed the word in its relation to *historiæ*, would have referred to the fact.

To appreciate Livy's greatness we must consider the character of the writings of his predecessors in this field, for, with the exception of Sallust, Roman historians before Livy were narrators of facts and recorders of events, mere annalists. (See ANNALS.) Livy, following the methods of his predecessors, built upon the foundation laid by them, and used with entire freedom, and evidently without a suspicion of plagiarism, the work of earlier historians. He relied largely upon the great Greek historian Polybius (q.v.); judging from the fragments of the latter's account of the Macedonian wars, we may say that Livy took his information directly, omitting Greek references and polemical notes, and supplementing what could not be readily understood by the Romans. In the account of the Second Punic War he probably used Polybius, although the Roman annalist Cælius Antipater was his leading authority for this period. Livy speaks very coldly of Polybius, and in fact not at all until book xxx, although he had used his work through the third decade. He relied upon Valerius Antias in the first decade, but later on condemned him for his exaggerations and unreliability. Livy also used many other writers, such as Quadrigarius, Calpurnius Piso, and Silenus, a Greek who wrote in a pro-Carthaginian spirit.

When Livy's authorities disagreed, he did not seek to sift their statements, as a contemporary modern historian would, but followed his own fancy or struck an average, or followed the most popular current account. Sometimes he stands for the view represented by the majority of the authorities, or for the earliest and most probable account, or, influenced by his sympathies, recognizes the pro-Roman or most picturesque or impressive views, aiming all the time at the effective story. That he had no desire to tell the truth, as Macaulay declared, is itself most untrue: see some sound remarks in Henry Nettleship, *Lectures and Essays: Second Series*, pp. 18–19 (Oxford, 1895), and M. H. Morgan, *Addresses and Essays*, pp. 13–18 (New York, 1910). Livy was by nature, beyond question, candid and truth-loving. His history is not of value as a critical work, falling below that of Polybius in this respect; but when we consider his patriotism and the charm of his style, we can understand Niebuhr's declaration that his history is a "colossal masterpiece." He was the national historian just as Vergil was the national poet. Livy accomplished the purpose of a great historian, although in not being an investigator he lacked a quality which Taine has declared to be requisite for an historian. In his celebrated preface he makes clear that he purposes to tell the story of the Roman people, and to tell it more effectively than it had been told before, with the aim of impressing his readers with the lessons to be drawn from the history of Rome in its progress to its culmination, and of drawing his own eyes away from the evils of his time. He declares that what happened before the foundation of the city he would neither indorse nor condemn. Thus, Livy may not have believed in Æneas or Romulus or Numa, but he did not think it his part to examine into the matter critically, for he intended to write not a critical but an ethical history of Rome. It is in his style that Livy stands preeminent. Although he is the great prose writer of the Augustan age, he does not follow the rhetorical style of Cicero, but, influenced by the diction of Vergil, he invented a new style, based on that of Cicero, but expanded and made mobile by the use of poetic words and phrases. He may be termed the first writer of Silver Latinity. It may be that this peculiarity in language and style brought upon him the charge of *Patavinitas*—from *Patavium* (Padua), Livy's birthplace—made by Asinius Pollio, and mentioned by Quintilian, 1, 5, 56, and 8, 1, 3, who, however, does not make clear what this charge implied. It may refer to his general style or to his use of provincialisms or to his free and enthusiastic way of speaking, at variance perhaps with the dignified restraint of Rome. Consult: Wiedmann, *De Patavinitate Livii* (Görlitz, 1848–54); Moritz Haupt, *Opuscula*, vol. ii (Leipzig, 1876); G. L. Hendrickson, "A Witticism of Asinius Pollio," in *American Journal of Philology*, vol. xxxvi (Baltimore, 1915). On Livy's style in general, consult the "Einleitung" to the edition by Weissenborn and Müller (Berlin, 1885); Henry Nettleship, *Lectures and Essays: Second Series*, pp. 108–110 (Oxford, 1895); Norden, *Die Antike Kunstprosa* (new ed., Leipzig, 1909).

In his early books he shows the influence of the subject matter upon his style, e.g., in his use of various archaisms, but when he reaches the account of the Second Punic War, and gives a description, e.g., of the visit of the Roman embassy to Carthage, and when he describes the Macedonian wars, he writes in a most brilliant and masterly way. His speeches are, perhaps, artistically the most perfect parts of his writings. They are given with no intention of reproducing the words of the speaker, but reflect the character of the individual, and describe his position and motives, as understood by Livy.

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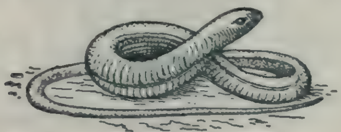
Translations.—The entire work is translated into Elizabethan English by Philemon Holland (London, 1600); books xxi–xxv are translated by Church and Brodribb (2d ed., London, 1890); the entire work is translated into German by Klaiber and Teuffel (2d ed., Stuttgart, 1854–56).

For further bibliographical aids, and for a general discussion of Livy, consult W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1910), and Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (3d ed., Munich, 1911).

LIXIVIATION, lĭk-sĭv'ĭ-ā'shŭn (from Lat. *lixivium*, lye, from *lix*, ashes, lye). The extraction of the soluble ingredients of solid substances by allowing dissolving liquids to percolate through them. In metallurgy, lixiviation processes date from early times and were largely used on silver and copper ores. In lixiviating silver ores the silver is first transformed into a chloride and then leached or dissolved with a solution of hyposulphite of soda. With copper ores, such as those of the Rio Tinto Mines in Spain, the copper sulphide is transformed into a sulphate and dissolved by leaching with water. Recently extensive investigations have been conducted by many mining companies to discover a commercial method of lixiviating copper carbonate ores and copper ores containing other minerals. These investigations have been successful and a few large lixiviating plants were being installed in 1914. A well-known use of lixiviation is the separation of the carbonates of sodium and potassium from the ashes of wood.

LIZA, lē'sȧ. See MULLET.

LIZ'ARD (OF. *lezard, lisard*, Fr. *lézard*, Sp. Portug. *lagarto*, It. *lacerta*, lizard, from Lat. *lacertus, lacerta*, lizard). A reptile of the order Lacertilia or Autosauria, characterized structurally by the fact that the halves of the lower jaws are connected by symphysis, i.e., fused solidly together in front, while those of serpents are connected by an elastic band; and by the fact that the teeth are fixed. The vertebræ are procœlous (except in most of the geckos), and have intercentra, especially in the tail. The caudal vertebræ of most forms have a transverse septum of cartilage, forming a line of weakness—the point where the tail breaks off, as frequently happens. The ribs of the trunk articulate by their capitula only, the reduced tubercula being connected with the vertebræ by ligaments. In some groups the poststernal ribs meet in the median abdominal line, forming bony loops; in the flying dragons the ribs support winglike expansion. Most lizards are provided with fully developed limbs and five-toed feet; but the feet are modified in the chameleons (q.v.), and in some degraded forms, as the glass snake and especially the amphisbæna (q.v.), which burrow, not only have the limbs been lost externally, but in some cases the pelvic and pectoral girdles have completely disappeared, accompanied by an elongation of the body, so that these lizards are serpent-like in form and habits. The skull is modified principally in the composition of the temporal arches; the quadrate bone is movable except in the degraded families. The hyoid apparatus, extended into the tongue, is always present and well developed. In the Old World lizards the teeth are planted along the top of the ridge of the jaw (acrodont), while in the New World species they are fastened to the inner side of the ridge (pleurodont). In one American genus (*Teius*) the teeth of the young are pleurodont, but in the adult they become acrodont. The tongue is variously developed, but is always furnished with many tactile or with gustatory corpuscles. When the tongue is very long and narrow it is generally forked, and in such cases, e.g., in the monitors, it is used almost entirely as a sensory organ. In most lizards it assists in catching the food, and in some families is an elaborate instrument. Salivary glands are wholly labial, and in a single genus (*Heloderma*) become poison sacs. The digestive organs present little peculiarity, except in the cloaca, which is much modified in correlation with the strange copulatory apparatus, consisting of paired organs external to the cloaca, each a tube of erectile tissue, which can be everted like the finger of a glove. When at rest and withdrawn the organs form slight conical longitudinal swellings on either side of the root of the tail. Only one organ is inserted at a time. Most lizards lay eggs, in some cases having a hard shell, but more often a parchment-like covering. The embryos are usually much advanced before the extrusion of the egg, and some species, as the American horned toads, are practically viviparous. The embryos within the hard-shelled eggs have an egg tooth or hard point upon the end of the snout, to assist them in breaking out. Certain mysterious organs beneath the ventral skin, largely composed of fat, and hence called fat bodies (consult Butler, *Proceedings of the Zoölogical Society of London*, 1889), seem to be related to the sexual functions. Lizards (except degraded subterraneous forms) have good ears and eyes, the latter with movable eyelids (except in geckos) and a nictitating membrane; but desert-dwelling and other unusual forms have special adaptations elsewhere spoken of, e.g., under Chameleon. Binocular vision, of course, does not occur here, any more than in other animals whose eyes look sidewise.



GLASS-SNAKE LIZARD.

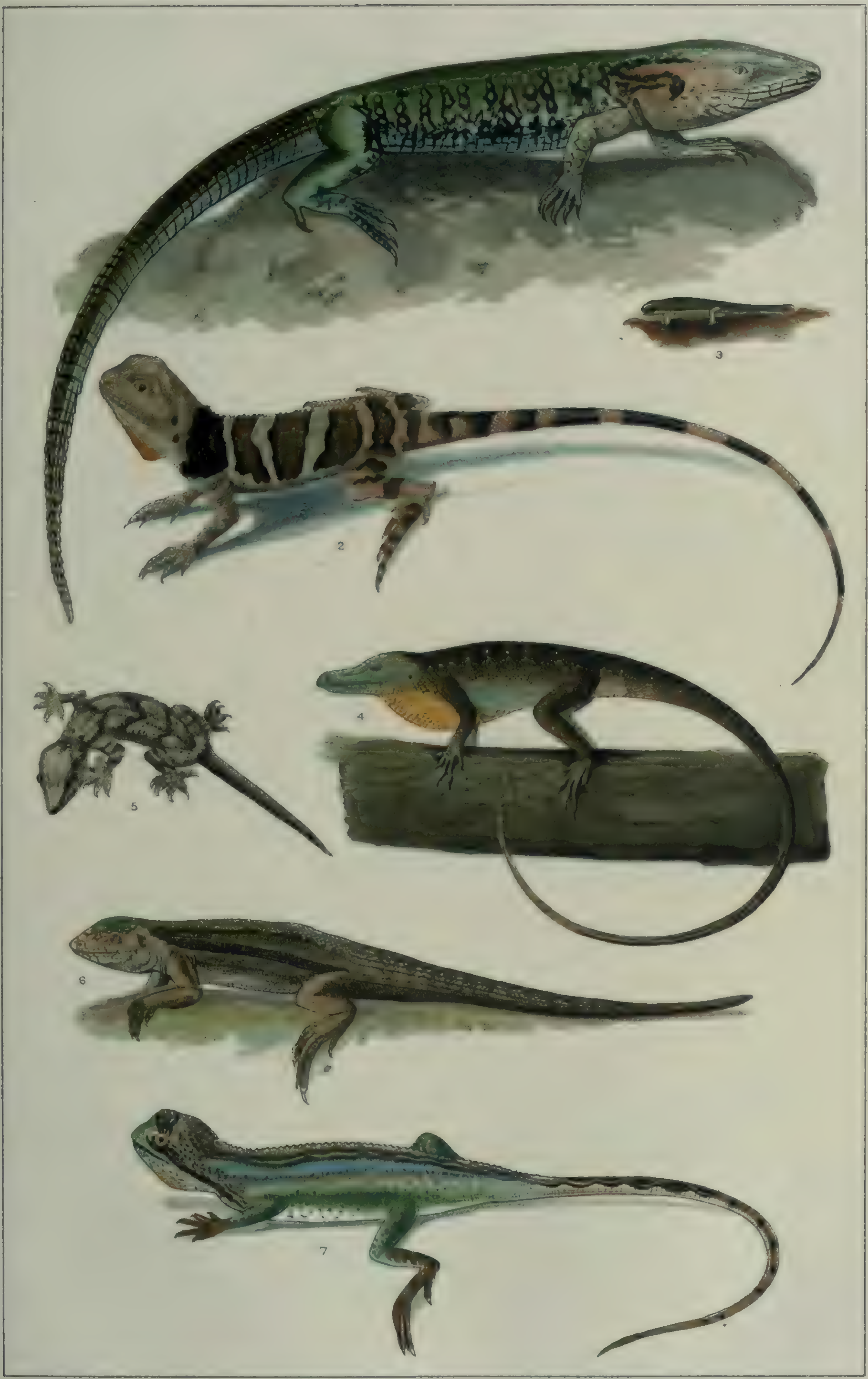
Externally, lizards assume a great variety of shapes, from the toadlike proportions of the moloch to the vermiform aspect of an amphisbæna; but usually the head is shapely, the neck apparent, and the tail long and distinct. The tail, indeed, is of much importance in many cases as a whiplike weapon, or as a means of safety by the ease with which it breaks off when seized, thereby giving the animal a chance to escape. By some species it is voluntarily thrown off in such an emergency, enabling the lizard to run to a refuge while the surprised foe is occupied with the cast-off and wriggling tail. Such lizards have the power of regenerating a tail, or rather a substitute for one, since the new tail contains in place of real vertebræ only a nonsegmented rod or tube of fibrocartilage. In most of the higher lizards the muscles, skins, and scales are reproduced, but among a variety of lower forms the scaling is abnormal, and is sometimes a reversion to an ancestral form. Consult Boulenger, *Proceedings of the Zoölogical Society of London*, 1888, page 351; and id., 1891, page 466. See Regeneration.

The skin of lizards, like that of snakes, is normally covered with scales, the thin, horny coating of which is shed periodically; but the amphisbænas have nearly lost all scales, and the glass snake (*Anguis*) sheds its skin in one piece. In many cases, however, the scales are not typical, but appear as little tubercles (osteoderms), such as are seen in the geckos and Gila monster, so that the whole skin looks granular or pebbled; or these dermal ossifications may be confined to the scales or shields of the head, as in the Lacertidæ. The skin is entirely devoid of glands, although certain minute excretory organs lie under the cutis of the thighs. Lizards vary greatly in color; the numerous desert-dwelling forms are, as a rule, of dull hue, and capable of little change, while forms dwelling in forests or grassy places are often highly colored, and have great power of metachrosis, as is familiar in chameleons. The chromatophores, according to Gadow, are embedded in the deeper layers of the cutis, and send out movable contractile processes, in which their pigmental protoplasm is conveyed towards or away from the surface. Black, red, yellow, and white, with their combinations of gray and brown, are the usual colors. The white pigment is made up of guanin salts. Blue and green are structural colors which are not traceable to pigment. (For the method of service of these voluntary color changes in adaptation to surroundings, see Metachrosis.) In addition to protective coloration some lizards are defended by horns and spines, which sometimes cover the entire body, as in the horned toads and the moloch (qq.v.), and sometimes grow only upon certain parts, most frequently the tail. Others have defensive or menacing appendages and corresponding habits, such as are manifested by the frilled lizards, the basilisk, the iguana, and others that make themselves look terrifying, when in fact, like all the rest (except *Heloderma*), they are harmless.

Lizards are found in all the warmer regions of the earth; their northern limit is about the annual isotherm of 50° F. (See Map under Distribution of Animals.) They are most numerous in tropical and warm countries; none occur in polar lands. In temperate regions they pass the winter in a state of torpidity, concealed under earth and débris or in hollow trees.

USE OF TONGUE BY CHAMELEON IN CATCHING INSECTS.

LIZARDS



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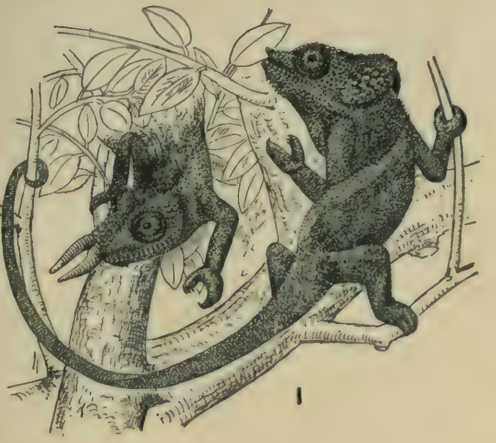
1 AMIVA SURINAMENSIS
2 URANISCODON UMBRA
3 MICROBLEPHARUS MAXIMILIANI
4 ANOLIS PUNCTATUS
5 HEMIDACTYLUS MABOUIA
6 CENTROPYX STRIATUS
7 ENYALIUS CATENATUS

LIZARDS



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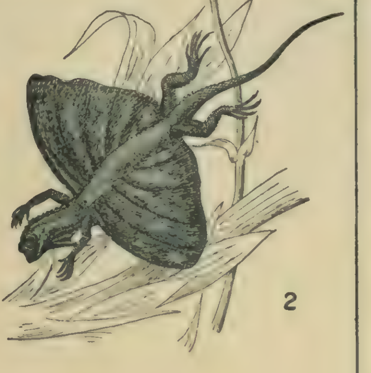

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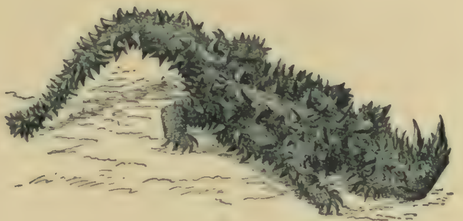

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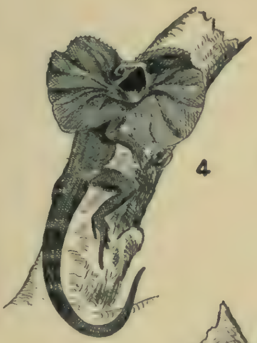

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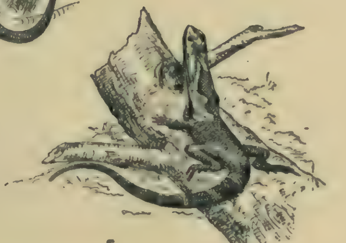

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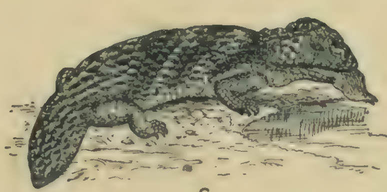

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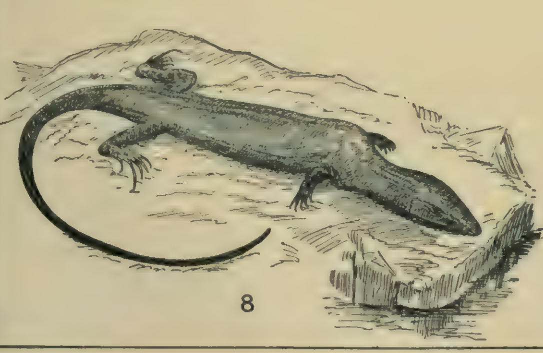

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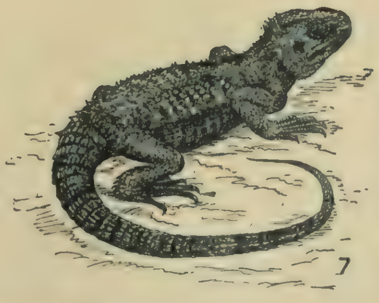

7

1. AFRICAN TYPES OF CHAMELEON.
2. FLYING DRAGON (Draco volans).
3. AUSTRALIAN MOLOCH (Moloch horridus).
4. FRILLED LIZARD, with frill expanded.
5. FRILLED LIZARD, with frill folded.
6. AUSTRALIAN SKINK (Trachysaurus rugosus).
7. EUROPEAN AGAMA (Agama stellio).
8. EGYPTIAN MONITOR (Varanus Niloticus).

Many are restricted to deserts, and have acquired interesting adaptations for resisting the blowing sand and otherwise withstanding the hardships of a hot and barren habitat. Other families are arboreal, or dwell among rocks. One species (of the Galapagos Islands) is marine, and several African and Oriental lizards are more or less completely aquatic. Most of these swift and agile reptiles are insectivorous, but some are carnivorous or even cannibalistic, and certain sluggish forms, as the iguanas, are herbivorous, and their flesh is palatable and nutritious for human use. The eating of noxious grubs and insects is a valuable service by lizards to man; and these little animals furnish food for a great variety of other reptiles, birds, and beasts of prey.

Classification. The lizards are regarded by recent authorities as one of two sections (the other being the snakes) of an order of reptiles usually called Squamata. Dr. Gadow in a review of the matter (1900) regards the lizards as an order (Autosauri, or Lacertilia), divisible into three sections:

1. *Geckones* (vertebræ amphicœlous) contains the family Geckonidæ, comprising the geckos proper (Geckoninæ), the Eublapharinæ, and the Uroplatinæ. See GECKO.
2. *Lacertæ* (vertebræ procœlous) contains the ordinary lizards—agamas, iguanas, African zonurids, glass snakes, heloderms, monitors, South American tejids, typical Old World lizards (Lacertidæ), skinks, and several small families including the degraded amphisbænas and snakelike aniellids of California and the pygopodes of Australia.
3. *Chamæleontes*—a single family with 50 or 60 species. See CHAMELEON.

Fossil Lizards. Fossil remains of lizards of the suborder Lacertilia are not well known. A few have been found in the Cretaceous and Tertiary rocks of Europe and North America, and the largest known lizard is a fossil species (*Varanus priscus*) from the Pleistocene beds of Queensland, Australia, which had a length from nose to tip of tail of about 30 feet. Many other fossil forms of lizard-like reptiles are not closely related to the Lacertilia of modern times. Such are the great sea serpents, Ichthyosaurus, Plesiosaurus, Mosasaurus, etc., of Mesozoic ages; the amphibious Rhynchocephalians of the Permian and Mesozoic, and some of the Mesozoic dinosaurs, all of which are described in separate articles. See DRAGON; HOLBROOKIA; and Plates of LIZARDS; IGUANAS AND OTHER AMERICAN LIZARDS.

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LIZARD FISH. One of a family (Synodontidæ) of marine fishes of the order Iniomi (q.v.), which have elongated bodies, very wide mouths, small close scales, and usually photophores. Some inhabit deep waters, and others live near shore, mostly in the tropical regions. The name ordinarily refers in America to a mottled-olive (yellowish beneath) species (*Synodus fœtens*), common from South Carolina to Brazil on sandy shores, which is known also as lagarta, galliwasp, and soapfish. It reaches a length of 12 inches, and, like the other species, is voracious and active. A well-known larger species of southern Europe (*Synodus saurus*) is known among the Italians as lacerto and tarentola. See Plate of LANTERN FISHES.

LIZARD HEAD. The southernmost cape of England, in Cornwall, a bold headland amid picturesque cliff and rock scenery which attracts many tourists, 16 miles southwest of Falmouth (Map: England, A 6). It is surmounted by two fine lighthouses visible 21 miles. It is the *Promontorium Damnonium* of Ptolemy. The name Lizard is also applied to the peninsula of which the Head is the southern point.

LIZITA, lė-sē′tȧ. See MULLET.

LJUNGGREN, lyụng′grān, GUSTAF HÅKON JORDAN (1823–1905). A Swedish critic, born at Lund. He studied in his native town, was made docent of æsthetics at the university there in 1847, and in 1859 professor of æsthetics and literature. In 1847 he obtained the doctorate. From 1875 to 1885 he was rector of the university. His principal work is *Svenska vitterhetens häfder efter Gustaf III.'s död* (5 vols., 1873–95), and his other literary and critical studies include: *Svenska dramat intill slutet af sjuttonde århundradet* (1864); *Bellman och Fredmans epistlar* (1867); *Smärre skrifter* (3 vols., 1872–81); *Från en resa* (1871).

LLAMA, lä′mȧ (the native name). A South American quadruped of the camel family. It is no longer regarded as a distinct species, but as a domesticated variety of the guanaco (q.v.). It was in general use as a beast of burden on the Peruvian Andes, and the only beast of burden used by the natives of America, before the horse and ass were introduced by Europeans. It is still much used in this capacity on the Andes, the peculiar conformation of its feet enabling it to walk securely on slopes too rough and steep for any other animal. The burden carried by the llama should not exceed 125 pounds. When too heavily loaded, the animal lies down and refuses to move, nor will either coaxing or severity overcome its resolution. It is generally very patient and docile. Indeed it has almost no means of efficient offense, although it sometimes attempts to bite. A very disagreeable manner of expressing its feelings is by spitting. Its saliva is of an unpleasant odor, and it can eject this with considerable force and accuracy. Visitors to zoölogical gardens are often witness to this habit, and a riding llama will, when aggravated, occasionally turn its head and spit at its rider. Its rate of traveling is about 12 or 15 miles a day. The llama is about 3 feet in height at the shoulder, has a long neck, and carries its head elevated. The females are smaller and less strong than the males, which alone are used for carrying burdens. The color is various, generally brown with shades of yellow or black, frequently speckled, rarely quite white or black. The flesh is spongy, coarse, and not of agreeable flavor. The hair or wool is inferior to that of the alpaca, but is used for similar purposes: that of the female is finer than that of the male. The llama has been introduced with the alpaca into Australia, but it is only adapted for steep mountain regions and has never become generally useful. See LAMA; ALPACA. See Plate of CAMELS AND LLAMAS.

LLANDUDNO, lȧn-dụd′nȯ, *Welsh pron.* thlȧn-did′nȯ. A fashionable watering place in Carnarvonshire, North Wales, situated between the Great and Little Orme's heads, 40 miles west-southwest of Liverpool (Map: Wales, C 3). It has picturesque surroundings, a fine beach for bathing, pier, marine drive 5½ miles long, promenade, golf links, hydropathic establishments, and good hotels. At the top of the Great Orme stands the small and primitive church of St. Tudno, from which the town takes its name. Llandudno is noted for its exceedingly bracing climate, which attracts about 50,000 visitors each year, chiefly from Lancashire. The town owns its water, gas, electric-lighting, and power works in connection with a refuse destructor, and maintains abattoirs and markets. Pop., 1901, 9300; 1911, 10,469.

LLANELLY, thlȧ-nĕth′lĭ. A market town and seaport in Carmarthenshire, Wales, 10 miles west-northwest of Swansea (Map: England, B 5). It has large copper, iron, and tin-plate works, potteries, and neighboring coal mines. Its docks are commodious, and it carries on an important shipping trade in its industrial products. The town is progressive and owns its water works, markets, two market halls, abattoir, athenæum, two town halls, park, pleasure grounds, free library, and considerable remunerative real estate. The United States is represented by a consular agent. Pop., 1901, 25,600; 1911, 32.071.

LLANES, lyä′nȧs. A town on the north coast of Spain, in the Province of Oviedo, 44 miles west of Santander (Map: Spain, C 1). It has a Gothic church built in the fourteenth century, a well-equipped high school, a new municipal hospital, and many interesting old buildings, among which are the ruins of an old fortress and several ruined palaces and convents. The town manufactures butter, cheese, pottery, and leather. It was formerly of considerable commercial importance, but its small, shallow harbor is now used only by a few coasting vessels. Pop., 1900, 18,781; 1910, 21,779.

LLANGOLLEN, lăn-gŏth′len, *Welsh pron.* thlȧn-gŏth′len. A town in Denbighshire, Wales, picturesquely situated on the Dee in the hill district (Map: England, C 3). The town is a great tourist resort, famous for the beautiful Vale of Llangollen and its antiquities. Among its interesting features is the bridge built in 1346 and considered one of the *Tri Thlws Cymru* (three beauties of Wales). Near Llangollen is Valle Crucis Abbey, the ruins of an ancient Cistercian foundation, the most important monastic ruin in Wales. The abbey church, dating from 1250, contains a fine rose window still in good preservation, and there are considerable remains of the original monastic buildings. Plas Newydd, the residence of the celebrated "Ladies of Llangollen," lies just outside the town. These ladies, Lady Eleanor Butler and the Hon. Sarah Ponsonby, swore eternal friendship, and, leaving their homes in 1776, lived here together till the death of the former in 1829, the survivor living two years more. The house was bought for them with the savings of their faithful servant, Mary Carryl, who died in 1809. Pop., 1901, 3300; 1911, 3249. Consult Robert Simpson, *History of Llangollen* (3d ed., Llangollen, 1852).

LLANO ESTACADO, lä′nȯ, *or* lyä′nȯ, ȧ′stȧ-kä′ᴅȯ. An extensive level plateau in northwest Texas and southeast New Mexico (Map: New Mexico, F 4). It forms a part of the Great Plains along the east slope of the Rocky Mountains, from which it is separated by the valley of the Pecos River. It is about 400 miles north and south, by about 150 miles east and west. It reaches its maximum altitude, 5500 feet, on its west border, whence it slopes southeastward, its east and south borders having an altitude of about 2000 feet. It is bounded on all sides by steep escarpments or palisades, whence its Spanish name, which means 'palisaded plain.' These are highest on the east side, where they are eroded into very irregular lines by the headwaters of the numerous Texas rivers flowing into the Mississippi and the Gulf of Mexico. The top of the plateau is an arid waste almost destitute of surface water. Considerable quantities of water, however, collect during the wet season on the impervious bedrock which underlies the porous sandstone and can be obtained by boring. During the wet season, also, the plateau produces grass enough to support cattle, but agriculture cannot be carried on without irrigation.

LLANOS, lä′nōz, *Sp. pron.* lyä′nȯs (Sp., plains). A common term in Spanish America for treeless plains, or prairies. In a restricted geographical sense it is applied to the great level tract in Venezuela and Colombia between the Orinoco on the east and the first foothills of the Andean Cordillera on the west, and stretching from the northern coastal regions of Venezuela to the forested regions of the Amazon basin. This region, measuring about 150,000 square miles, is elevated only a few hundred feet above the sea and for great distances presents an unbroken expanse of flatland. The lower portions (*llanos bajos*) lying along the rivers are subject to inundation during the wet season from June to October; they support a heavy growth of grass, which generally remains green throughout the year. The highest stretches (*llanos altos*) are more or less diversified by undulating or flat-topped hills; they present a changing appearance, being grass-covered during the wet season and almost barren in the dry months. Grazing is the chief industry of the inhabitants (*llaneros*), who are a mixed race of Spanish and Indian blood. The climate is hot, generally moist, and in some regions malarial. See VENEZUELA; COLOMBIA.

LLANQUIHUE, lyȧn-kē′wȧ. A province in south Chile, bounded by the Province of Valdivia on the north, Argentina on the east, the Province of Chiloe on the south, and the Pacific Ocean on the west (Map: Chile, E 6). Its area is 35,396 square miles. The surface is mountainous in the east and west, while in the centre is a valley occupied by Lake Llanquihue (q.v.), the largest in Chile. The province is well watered and to a great extent covered with forests. The climate is humid but healthful. The chief occupations are agriculture, stock raising and forestry, and considerable quantities of agricultural and animal products and timber are exported to parts of Chile as well as to Germany. The inhabitants numbered 105,043 in 1907 and were estimated at 116,094 in 1911. The capital, Puerto Montt, on the south coast of the province, has a good harbor and an estimated population of 6000.

LLANQUIHUE. The largest lake in Chile.

It is situated in the province of the same name and at the base of the volcano of Osorno (Map: Chile, E 6). It is 30 miles long and of the same width and is of great depth. The lake receives hardly a single tributary, being fed by water filtered through the porous volcanic rock of the region. Its outlet to the sea is through the Maullin River. It was discovered by Pedro Valdivia in 1552.

LLEREN, lyā′rĕn. A name given to *Calathea allouya*, a plant of the family Marantaceæ. It has long been cultivated in Porto Rico for its small, crisp, nutlike tubers, which are formed in great abundance and which are highly prized for food.

LLEWELLYN AP GRIFFITH, lōō-ĕl′ĭn ȧp grĭf′ĭth, or Llywelyn ab Gruffydd (?–1282). A native prince of Wales. He and his brother succeeded their uncle, David ap Griffith, in 1246; in 1254 they quarreled, and Llewellyn, conquering his brother, became sole ruler. He revolted from his allegiance to the English in 1256 and joined with the party of Montfort, but made peace with Henry III in 1267. On the accession of Edward I he refused to do homage. His fiancée, Eleanor de Montfort, was captured by the English in 1275, and war followed in 1276. The English invaded his territory, and in 1277 he surrendered part of his domains and went to London, while Eleanor was given back to him. He soon returned to Wales and renewed the war with the English by a sudden revolt on Palm Sunday, 1282; he was slain December 11 of the same year. Consult: Charles Bémont, *Simon de Montfort* (Paris, 1884); J. E. Morris, *Welsh Wars of Edward I* (Oxford, 1901); T. F. Tout, *Political History of England* (London, 1905).

LLORENTE, lyô-rân′tâ, Juan Antonio (1756–1823). A Spanish historian, born at Rincon del Soto, near Calahorra, in Aragon. He took holy orders in 1779, but turned to the study of canon law, became advocate of the Council of Castile in 1781, vicar-general of Calahorra in 1782, and general secretary of the Inquisition in 1789. A Liberal of the party of Jovellanos (q.v.), he lost his employment when Jovellanos fell in 1801. In 1805 he won the favor of Godoy by an attack on the liberties of the Basque Provinces, published in the form of an historical essay. When the French invaded Spain, Llorente attached himself to King Joseph, under whose order he investigated the archives of the Inquisition for two years after its abolition in 1809. Later he directed the abolition of the convents and the administration of their property. He had to flee to France on Napoleon's downfall in 1814. There he lived till 1822, when the publication of *Portraits politiques des papes* caused his banishment at the instigation of the clergy. Llorente's most important work is the *Histoire critique de l'inquisition d'Espagne* (1817–18). He also wrote the *Memorias para la historia de la revolución española* (1811–16) and an autobiography (1818). Consult A. J. Méhul, *Notice biographique sur Don J. A. Llorente* (Paris, 1824).

LLOYD, loid, Francis Ernest (1868–). An American botanist, born in Manchester, England, and educated at Princeton University (A.B., 1891; A.M., 1895), Munich, and Bonn. Between 1891 and 1912 he was a member of the faculties of Williams College, Pacific University, Teachers College (Columbia), Harvard Summer School, and Alabama Polytechnic Institute (professor of botany, 1908–12). After 1912 he held the chair of botany at McGill University, Montreal, Canada. He served as an investigator in the Desert Botanical Laboratory of the Carnegie Institution in 1906 and as cytologist of the Arizona Experiment Station in 1907, and in 1907–08 directed investigations for the Continental-Mexican Rubber Company. He edited *The Plant World* in 1905–08; was coauthor of *The Teaching of Biology in the Secondary Schools* (1904; 2d ed., 1914) and author of *The Comparative Embryology of the Rubiaceæ* (1902), *The Physiology of Stomata* (1908), and *Guayule* (1911); and contributed to the New International Encyclopædia.

LLOYD, Henry Demarest (1847–1903). An American writer on economic subjects, born in New York City. He was educated at Columbia University, was for a time lecturer on political economy in New York schools, later studied law, and was admitted to the bar in 1869. From 1872 to 1885 he was with the *Tribune* of Chicago, latterly in an editorial capacity. He also held the secretaryship of the American Free Trade League. The first of his publications, *A Strike of Millionaires against Miners* (1890), told the story of the troubles at the Spring Valley (Ill.), coal mines in 1889. Later writings, many of which appeared posthumously, include: *Wealth against Commonwealth* (1894); *Labor Co-Partnership in Great Britain and Ireland* (1898); *The Country without Strikes: New Zealand* (1900); *Newest England: New Zealand and Australia* (1900); *Man, the Social Creator* (1906); *A Sovereign People: A Study of Swiss Democracy* (1907); *Men, the Workers* (1909); *Lords of Industry* (1910); *Mazzini and Other Essays* (1910).

LLOYD, William (1627–1717). Bishop of Worcester, England. He was born at Tilehurst, Berkshire; was educated at Oriel College, Oxford; was ordained priest in 1656 and appointed chaplain to Charles II; became Dean of Bangor in 1672; and was made Bishop of St. Asaph in 1680, Bishop of Lichfield and Coventry in 1692, and Bishop of Worcester in 1700. He took an active part in the religious controversies of his time and was one of the seven bishops imprisoned in the Tower for their protest against the declaration of indulgences to Catholics and Dissenters by King James II. He supported the revolution of 1688 and was appointed almoner to William and Mary and to Queen Anne. He furnished valuable materials to Bishop Burnet's *History of my Own Time* and, besides pamphlets on the Roman Catholic controversy, tracts, and sermons, published: *A Chronological Account of the Life of Pythagoras and of his Famous Contemporaries* (1699); *A Dissertation on Daniel's Seventy Weeks* (1690); *A System of Chronology* (1690).

LLOYD, William Watkiss (1813–93). An English classical and Shakespearean scholar, born at Homerton, Middlesex. Without university training and despite 36 years given mostly to an uncongenial business, he made for himself a recognized place as a learned and acute critic and as a connoisseur. Trustworthy from the standpoint of scholarship, his work is weak in concision, in artistic arrangement, and in the literary graces. On the classical side it is well represented by *Xanthian Marbles* (1845), *The History of Sicily* (1872), and *The Age of Pericles* (1875). As a Shakespearean critic, he may be advantageously known by his essays scattered through the Singer edition (1856, 1875) of the dramatist, by his prefatory essay to his edition of *Much Ado about Nothing* (1884), and by contributions to periodicals and the transactions of learned societies. For further biographic and bibliographic information, consult the memoir, by Sophia Beale, prefixed to Lloyd's posthumously published *Elijah Fenton: His Poetry and Friends* (London, 1894).

LLOYD-GEORGE, David (1863–). A British statesman and reformer. He was born in Manchester, of Welsh parentage. His father, a poor and invalid schoolmaster, died in early manhood, and Lloyd-George was brought up under humble circumstances in Wales by an uncle, a Baptist shoemaker. The boy pushed his way upward through school, studied for the law, and thrust himself, while yet in his teens, into the first ranks of those Welshmen who contended most vigorously for complete freedom from the dominance of the Church of England. As winner of a great lawsuit that involved the right of burial in parochial burying grounds, he became well known, and in 1890 he was elected to Parliament, a member of which he remained thereafter without interruption. The first 10 years of his parliamentary career were in no wise remarkable. The little lawyer, without influence, without money, without even the advantages of university training or environmental culture, bade fair to be known simply as a fiery and intransigent Welshman. But the Boer War changed all this. Throughout that struggle Lloyd-George fought the government tooth and nail. The Liberal party, completely torn asunder by the conflict, offered but a feeble opposition towards the war; not so Lloyd-George. The Boer cause was his cause, and for the enemy of Great Britain he contended warmly, even to the imminent danger of his life; for during these trying years, hated, abused, and even mobbed, he was the most unpopular man in Great Britain. But during the period of reaction that followed close on the heels of war the reputation of Lloyd-George rose rapidly. His stalwart independence, brilliant debating, and sheer ability made his inclusion in the Liberal ministry of 1906 almost inevitable, and there were few who thought his inclusion even in the cabinet itself, as President of the Board of Trade, an undeserved appointment. In this office, indeed, he won high opinions from all sides; his masterful treatment of the Port of London imbroglio and of controversies arising from foreign patents won approval even in the highest financial circles of the conservative city.

In 1908 Lloyd-George was made Chancellor of the Exchequer, and as such found himself sponsor for an old-age pension bill, already in its main outlines drawn up by his predecessor. It met with sharp and caustic criticism, but was defended with such marked ability that on its passage Lloyd-George's reputation was greatly heightened. (See Old-Age Pensions.) Next came his great accomplishment, the famous Lloyd-George budget. To pay for old-age pensions and other social legislation of the new government, such as increased grants for elementary education, town planning, labor exchanges, etc., without diminishing the cost of naval preparations, required increased taxation. The Unionists proposed that it should come from tariff imposts; but Lloyd-George had another plan, and this he outlined in his budget speech on April 19, 1909. His proposals in brief were these: first, increased indirect taxation, by heavier taxes on tobacco, spirits, and a new tax on petrol used for motor cars; second, increases in the income tax, particularly on unearned incomes, and an additional supertax on incomes over £500; third (and this is the most revolutionary feature of his budget), a land tax which would confiscate for the state no less than 20 per cent of all increase in land valuation, with due exception for improvements. Financial London stood aghast at the scheme; the great banking houses, such as Rothschilds, united to oppose it; even Lord Rosebery, ex-Premier of Great Britain, came forth from his retirement to denounce it; and Lloyd-George soon found himself the centre of a fiery battle in which his vehemence and passion found full play. Adored by his supporters, hated by his enemies, Lloyd-George infused into his speeches such a daring wealth of invective and satire as even British politics had never called forth. The budget was rejected by the House of Lords by a vote of 350 to 75, despite the well-recognized principles that over money bills it had no customary jurisdiction, and on Dec. 3, 1909, Parliament was prorogued, and a new election ordered. The Liberals were returned to office with a majority of only two over the Unionists—a situation which necessitated their coalition with the Irish Nationalists and the Labor party. But the successful passage of the budget was secured eventually. See Tax.

During the ensuing year Lloyd-George actively defended the Parliament Bill, which aimed to cripple the veto power of the House of Lords; but the main brunt of the defense of that measure fell upon the Premier, Asquith (q.v.). In 1911, however, Lloyd-George became again the foremost figure in British politics by the presentation of the second of his great reforms, the National Insurance Bill. (See Workingmen's Insurance.) The year 1912 made no especial claim upon the services of the Chancellor of the Exchequer. And even in the matter of the disestablishment of the Anglican church in Wales, a measure dear to Lloyd-George's heart, the bill for its provision was officially in the hands of the Home Secretary, Reginald McKenna. When Irish Home Rule became the most pressing problem in British politics, it was Asquith who played the foremost Liberal rôle. In 1913 a government commission investigated a financial transaction, indiscreet though not dishonorable, in which Asquith, Lloyd-George, and other ministers had become involved. This was the purchase of shares in the American Marconi Wireless Company—a concern which had been subsidiary to, and which at the date of purchase was popularly believed closely allied with, the British company of the same name—and the latter at that time was negotiating for important government contracts.

In the same year Lloyd-George embarked upon a great and comprehensive reform campaign—one to free the land by breaking up the great estates, restoring the land to the people, and repopulating the half-deserted farm land of Great Britain. The instrument for accomplishing this end would seem to be ultimately land nationalization; the immediate weapon, a minimum-wage law for farm laborers, a law to safeguard tenant expenditures for improvements, extremely rigid inspection and building laws in the cities. (See SINGLE-TAX AND LAND NATIONALIZATION.) Beginning in the summer of 1914, the European War dwarfed all domestic interests. It devolved upon the Chancellor to arrange for war loans greater than had ever been required before. The financial situation, which was at first strained and uncertain, soon became normal again. (See WAR IN EUROPE.) In Asquith's coalition cabinet, formed May, 1915, R. McKenna succeeded Lloyd-George, who took the new post of Minister of Munitions.

Lloyd-George, unlike most British statesmen, gained distinction both in parliamentary debate and on the hustings. Without impressive figure or particularly powerful voice, not widely read nor trained in English history, nor even careful to ascertain the full truth of his many accusations, this leader, by his ability to coin words, expressions, phrases, that would catch like wildfire with the masses, by his vehemence, and his passion for the public weal, combined with a long and intimate acquaintance with the English Bible, made himself the most influential orator in Great Britain. Lloyd-George published: *Better Times* (1910), speeches; *The Call of Liberalism* (1912); *People's Insurance* (3d ed., containing text of the National Insurance Act of 1911, with explanations of the insurance commissioners, 1912). Consult, for a flattering review of his early life, J. H. Edwards, *From Village Green to Downing Street* (London, 1908); for a hostile account, G. E. Raine, *The Real Lloyd-George* (ib., 1913); for a detailed biography, Edwards and Duparc, *Life of David Lloyd-George* (4 vols., ib., 1913); and for the Lloyd-George policies, H. A. Walter, *Die neuere englische Sozialpolitik; mit einem Geleitwort des englischen Schatzkanzlers, David Lloyd-George* (Munich, 1914).

LLOYDS, loids. An incorporated association of underwriters, merchants, shipowners, ship brokers, and insurance brokers. The home office of the association is in London, where it occupies a suite of rooms in the Royal Exchange. The objects for which the association was formed are, according to the act of incorporation: (*a*) carrying on the business of marine insurance; (*b*) the protection of the interests of the members of the association; and (*c*) the collection, publication, and diffusion of intelligence and information with respect to shipping. The association is composed of members and subscribers, and no others are allowed to avail themselves of the privileges of the rooms. The members are of two classes, underwriting members who pay an entrance fee of £100 and are required to deposit securities to the value of £5000 to £10,000 as a guarantee of their engagements, and nonunderwriting members who pay a fee of 12 guineas. Subscribers pay an annual subscription of five guineas, but no entrance fee, and have no voice in the management of the affairs of the association. The management of the association and its operations is delegated to the "committee for managing the affairs of Lloyds," selected by the members from among themselves. Routine work is carried on by a secretary and assistants and a large clerical staff. The method of effecting insurance is for a broker to write upon a slip of paper the name of a ship and of her master, the character of the cargo, the amount at which it is valued, nature of the voyage, etc. If the risk is accepted, each underwriter subscribes his name and the amount of it which he will underwrite, the insurance being effected as soon as the total amount is made up. As the premium rate largely depends upon correct information upon all points connected with the risk in question, one of the first requisites of the association has been an efficient maritime intelligence department, and in the development of this the greatest success has been achieved.

The association of Lloyds had its origin over 225 years ago in the meeting of merchants for business and gossip in the coffeehouse kept by Edward Lloyd in Tower Street, London. The earliest mention of these meetings appears in the London *Gazette* of Feb. 18, 1688, but the character of the notice implies that they were then no new thing. Their growing importance led Mr. Lloyd to remove to Lombard Street in 1692, and soon afterward he began the issue of *Lloyd's News*, devoted to mercantile and maritime information, eventually succeeded by *Lloyd's List* (published daily), the second oldest newspaper in London. The merchants and underwriters continued to meet in the same manner during the greater part of the eighteenth century without any apparent organization or rules; but, as the business increased in volume, the merchants, underwriters, and associates moved first to a building in Pope's Head Alley and finally, in 1774, to the Royal Exchange. The association adopted in 1779 a printed form of policy differing but little from that in use to-day.

In 1811 the society was reorganized and in 1871 incorporated. Its agents are to be found in every maritime port in the world frequented by deep-sea ships. *Lloyd's Register of British and Foreign Shipping* is a volume published annually, containing information respecting vessels, their age, material, repairs, owners, captains, etc.; also details of docks and other maritime information. The office of the *Register* is distinct from Lloyd's of the Exchange.

The classification of ships, as regards their construction and seaworthiness, made by Lloyds surveyors and contained in the registers, dates from the middle of the eighteenth century, and in the earliest copy extant of *Lloyd's Register of Shipping*, dated 1764–65–66, vessels are classified in groups, designated by the letters A, E, I, O, U; A standing for a first-class ship. With these letters were used G, M, and B, referring to the equipment, and indicating whether it was good, middling, or bad. In the *Register* of 1768–69 the numbers 1, 2, 3, 4 are employed to denote the condition of the equipment, and the letters A, E, I, O, U are printed small. In the *Register* 1775–76 the hull is again described by Roman capital letters and the equipment by the figures 1 and 2. As iron ships began to be used, it was found necessary to classify them into grades, and in 1869, on the adoption of new rules for shipbuilding, numbers were used for iron ships, and a system of classification followed which in the main is still used. This classification of ships was determined by rules adopted to govern shipbuilders and was universally recognized by merchants and others, as it enabled them to determine the seaworthiness of a vessel by consulting the register. See articles A1 and SHIPS, CLASSIFICATION OF, FOR MARINE INSURANCE, for modern systems of classifying wooden and iron ships; LOAD-LINE MARKS OF VESSELS. Consult the occasional publications of Lloyds; Lloyd's *Rules for the Building and Classification of Ships;* and *Annals of Lloyd's*

Register of British and Foreign Shipping (London, 1884).

LLOYDS, Austrian. An association for general commercial and industrial purposes, founded in Triest by Baron Bruck in 1833, to supply the want, experienced by the maritime insurance companies of that port, of a central administration to attend to their common interests. This association, like its London prototype, has agents in all the principal foreign ports, whose duty it is to collect all information of a nature to affect the commerce and navigation of Triest and to keep a list of all entrances and clearances of ships at their respective ports. This information is published in the *Giornale del Lloyd Austriaco.* This company has established regular communication between Triest and all the important seaports in the Adriatic and Levant, by means of a large fleet of steamers, which also carry the Austrian mails. The society of Austrian Lloyds includes three sections: the first is composed of insurance companies, the second of steamboat companies, while the third or scientific department (established in 1849) has a printing establishment, an engraving room, and an artistic establishment for the perfecting of engraving on copper and steel. This last section has issued a great number of literary and scientific journals.

LLOYD'S BOND. The name of a security much employed in England during the period of railway construction, between 1850 and 1870, when railway companies were hampered by parliamentary restrictions upon their borrowing power. A Lloyd's bond, so called because introduced by Mr. John Horatio Lloyd, an English barrister, is a sealed acknowledgment of indebtedness and can be issued by companies in return for materials or services rendered, but cannot be sold for money. They have been held by the courts to be a valid claim upon the property of a company and to give the holder preference over ordinary creditors, although they possess no priority over debenture or mortgage bonds issued in accordance with the provisions of a company's charter. They constitute a preferred part of a company's floating indebtedness. English railways now have abundant borrowing power under the statutes and are no longer issuing Lloyd's bonds.

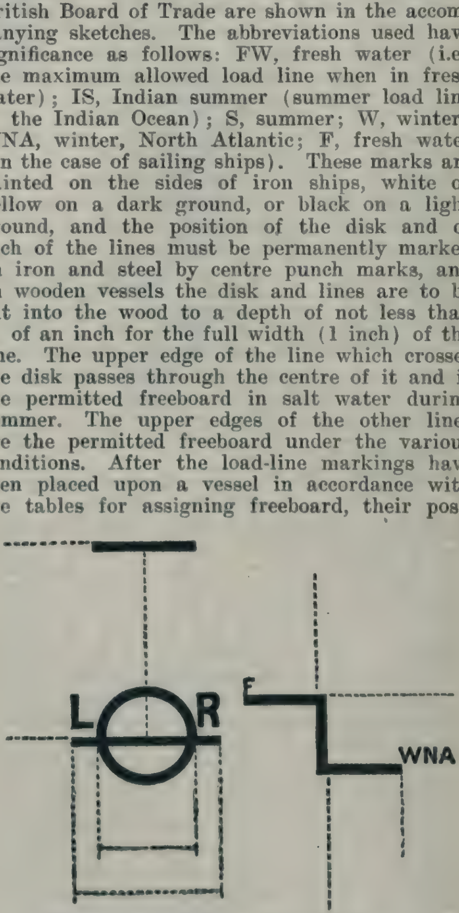
LLYWELYN AB GRUFFYDD. See Llewellyn.

LOACH, lōch, or Groundling (Fr. *loche,* Sp. *locha, loja,* loach). A fish of the family Cobitidæ, closely related to the carp family, which has an elongated body, covered with small scales, and a small head with 4 to 10 barbules around the mouth. The common species (*Nemacheilus barbatulus*) of the rivers and brooks of Great Britain seldom exceeds 4 inches in length and is highly esteemed by anglers and for food. The lake loach (*Misgurnus fossilis*) of the Continent is sometimes a foot long and inhabits the mud of stagnant waters, which gives its flesh a bad flavor. See Plate of Carp and their European Allies.

LOADING, Density of. See Ballistics.

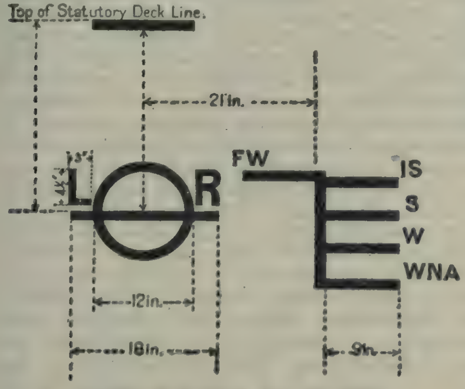
LOADING TRAY. A contrivance designed to facilitate the placing of projectiles in the bore of a heavy breech-loading gun without injuring the threads in the screw box or seat of the breech plug. It consists of soft metal or of wood with a lining of thin metal on its upper surface and covers the threads at the bottom of the screw box. The ordinary loading tray must be placed in the breech after it is opened and removed before it is closed. This takes several seconds, and, to avoid the loss of time thus entailed, some recent designs of breech mechanism provide a loading tray which is automatically placed in position.

LOAD-LINE MARKS OF VESSELS. The load line or load water line of vessels is the line in which the plane of the water surface cuts the hull of a ship when the latter is loaded. Many vessels are lost from overloading, and this fact led Samuel Plimsoll (q.v.), a member of the British Parliament, to prepare his Merchant Shipping Act, which became a law in 1876. This act was amended by the Merchant Shipping Acts of 1890, 1894, and 1906 and the marks provided for in those acts and the rules of the British Board of Trade are shown in the accompanying sketches. The abbreviations used have significance as follows: FW, fresh water (i.e., the maximum allowed load line when in fresh water); IS, Indian summer (summer load line in the Indian Ocean); S, summer; W, winter; WNA, winter, North Atlantic; F, fresh water (in the case of sailing ships). These marks are painted on the sides of iron ships, white or yellow on a dark ground, or black on a light ground, and the position of the disk and of each of the lines must be permanently marked on iron and steel by centre punch marks, and on wooden vessels the disk and lines are to be cut into the wood to a depth of not less than ¼ of an inch for the full width (1 inch) of the line. The upper edge of the line which crosses the disk passes through the centre of it and is the permitted freeboard in salt water during summer. The upper edges of the other lines are the permitted freeboard under the various conditions. After the load-line markings have been placed upon a vessel in accordance with the tables for assigning freeboard, their positions must be verified and approved by the Board of Trade, which issues a certificate of approval. This certificate may cease to be in effect after a survey which reduces the vessel in classification; in this case a new certificate must be issued (with possibly a new placing of the marks).



FREEBOARD MARKING FOR SAILING VESSELS.
Dimensions same as for steamers.

When the markings are duly placed, newly or originally, their positions and accuracy are verified by *Lloyd's Register* surveyors, and upon this being reported to the committee, a freeboard certificate is forthwith issued. Without a freeboard certificate issued by Lloyds or by some other authoritative source, no vessel (British or foreign) can clear (the British expression is "enter outwards") from any port in Great Britain. The Committee of *Lloyd's Register* assigns freeboard for foreign vessels in accordance with the tables, if the owners make application for the assignment, and it issues, with the concurrence of the Board of Trade, certificates similar to those given British vessels.



FREEBOARD MARKING FOR STEAMERS.

The position of the "statutory deck line," from which the load lines are measured, is defined in the Merchant Shipping Act of 1876 as follows:

"Every British ship (except ships under 80 tons' register employed solely in the coasting trade, ships employed solely in fishing, and pleasure yachts) shall be permanently and conspicuously marked with lines of not less than 12 inches in length and 1 inch in breadth, painted longitudinally on each side amidships, or as near thereto as practicable, and indicating the position of each deck which is above water.

"The upper edge of each of these lines shall be level with the upper side of the deck plank next the waterway at the place of marking.

"The lines shall be white or yellow on a dark ground, or black on a light ground."

The line abreast the uppermost deck which extends the full length of the ship is the "statutory deckline."

Under the British Merchant Shipping Act of 1894, the Committee of *Lloyd's Register* is empowered to assign freeboards to British vessels as required by the act. The form of marking adopted by Lloyd's is shown in the sketches, the letters L and R on each side of the disk indicating that the freeboards were assigned by the committee. If the freeboard is assigned by the Board of Trade surveyors, the letters B and T replace the L and R in the foregoing plans. In 1906 the British Shipping Laws were amended so that all foreign vessels loading at British ports are required to be provided with a freeboard mark assigned under the British rules and in accordance with the British tables, or under rules and tables of a foreign country which had been certified by the British Board of Trade as being equally effective with the British rules and tables. In the same year the British freeboard tables were revised, and important modifications made. In 1907 Germany adopted tables very similar to the British, while France, Holland, Denmark, Sweden, and Spain have adopted the British rules. All other nations are likely soon to follow their lead or prepare tables of their own. Consult: *Lloyd's Seaman's Almanac* (London, 1893); *Lloyd's Rules and Regulations for the Construction and Classification of Steel Vessels* (ib., new editions from time to time); *Instructions to Measuring Surveyors* (ib., new editions from time to time). Also see Lloyds; Ships, Classification of, for Marine Insurance; Registry of Vessels; Measurement of Ships.

LOAD′STONE. See Magnetite.

LOAISA CARVAJAL, lō-ī′sȧ kär′vȧ-häl′, Jerónimo (?1489–1575). A Spanish missionary to South America, born at Trujillo. He entered the Dominican Order at Córdoba, taught at Valladolid, was prior of Carboneras, became Bishop of Cartagena de Indias in 1537, built a cathedral, and established a school. He was transferred to the see of Lima, arriving in 1543, and was later (1548) made the first Archbishop. He acted as peacemaker in several rebellions, but after the death of the Viceroy, Mendoza, took the field against Girón. His chief work was the establishment of the Hospital of St. Anne, which is still in existence.

LOAM (AS. *lām*, OHG. *leimo*, Ger. *Leim*, *Lehm;* connected with AS. *līm*, Eng. *lime*, Lat. *limus*, mud, and ultimately with AS. *slīm*, Ger. *Schleim*, Eng. *slime*). A term widely though loosely employed by agriculturists and others to designate a soil consisting of a mixture of clay, sand, and decomposing organic matter (humus). Correctly used, loams are soils having a texture intermediate between sand and clay and contain a mixture of gravel, sand, silt, and clay in such proportions that the properties of no one of these textural groups predominate. They therefore lack the excessive porosity of sandy soils and the compactness of clay. Loams have a desirable structure, but are usually somewhat sticky when wet. They may be calcareous. A number of types of loamy soils can be recognized, depending upon the predominance of certain textural soil particles. We thus have sandy loams, silt loams, clay loams, gravelly loams, and stony loams. Although loam is of importance as a soil type, it may also be used for making bricks if clayey enough, and the more sandy varieties are often used for foundry sand. Consult L. L. Van Slyke, *Fertilizers and Crops* (New York, 1912). See Soil; Clay; Marl; Sand.

LOAN (AS. *lān*, *læn*, OHG. *lēhan*, Ger. *Lehen*, *Lehn*, loan; connected with Goth. *leihwan*, AS. *lēon*, OHG. *līhan*, Ger. *leihen*, to lend, OIr. *leicim*, I leave, Lith. *likti*, Lat. *linquere*, Gk. λείπειν, *leipein*, Skt. *rich*, to leave). In law, either the delivery of money or any article of personal property by one person to another for which an equivalent return in kind is to be made, or the bailment of a personal chattel to be specifically returned to the person making the loan. An important distinction to be noted between the two classes of loans is that in the first kind title to the property lent passes to the borrower and the person making the loan has in the case of a chattel only a contract right to recover damages if the borrower fails to keep his agreement, and in the case of money to recover the amount loaned in an action of debt. Whereas in the second class the borrower acquires possession only as bailee and not the title to the property borrowed, and the lender may compel a return of the property lent by an action in replevin or may recover damages for its conversion (see Trover) if the borrower fails to return it.

The second class of loans may belong either to the class of bailments for the mutual benefit of the bailor and bailee, in which case the bailee is bound to exercise due care for the safety of the property lent—i.e., such care as a prudent man would take of his own property—or they may belong to the class of gratuitous bailments, the delivery of an article to the bailee, for his use, without compensation, and on condition of its return to the bailor. As this kind of bailment is entirely to the advantage of the bailee, he is bound to use extraordinary care and is responsible for slight negligence in the use of the bailment. He is not responsible for the natural deterioration by ordinary wear and tear of the article delivered, but with that exception must return the article to the bailor in as good condition as when it was received. The diligence to which the bailee is held in the care of the property depends upon its character and value and the dangers to which it is exposed. Consult the authorities referred to under Contract. See Bailment.

LOAN ASSOCIATIONS. See Building and Loan Associations.

LOANDA, lō-än′dȧ, Saint Paul de. A seaport of Africa. See Saint Paul de Loanda.

LOANGO, lō-äṉ′gō. A coast district of West Africa, extending about 200 miles northward from the mouth of the Congo to the vicinity of Mayumba (Map: Africa, F 5). The coast is partly low and marshy, partly steep and rocky, and the interior rises in terraced plateaus. The chief products are palm oil and rubber. The northern half of the district lies within French Equatorial Africa; the extreme southern part belongs to Belgian Congo, while the middle portion, called Cabinda (q.v.), belongs to Portugal. The Loango district was originally a part of the native Congo Empire. It was then for a time an independent native kingdom until the arrival of the Portuguese, the Dutch, and the French, in the seventeenth and eighteenth centuries. It was for a long time the centre of the West African slave trade. The chief settlement is Loango.

LOANGO. The chief settlement on the French Loango (q.v.) coast, West Africa, and the principal commercial port of French Equatorial Africa, situated 100 miles north of the mouth of the Congo River (Map: Congo, B 3). During the independence of the native Loango State it had a population of over 15,000, but is now little more than a collection of European trading factories. It has a well-sheltered roadstead, but so shallow that ships lie 3 miles off the shore and discharge into lighters. It is connected with Brazzaville, the capital of the French Middle Congo, by telegraph and with Europe by the submarine cable.

LOBACHEVSKY, lō′bȧ-chĕf′skē, Nikolai Ivanovitch (1793–1856). A Russian mathematician, born at Nizhni Novgorod, the son of a peasant. He studied at Kazan, where he became adjunct professor of mathematics in 1814 and professor in 1816. He held this position for 40 years, and for 19 years he was rector of the university. In 1829–30 he published the first geometry which was not based upon the Euclidean postulate of parallel lines (see Geometry) and thus became the founder of the non-Euclidean geometry. (See also Bolyai.) His works are as follows: *Principles of Geometry* (original in Russian, 1829–30); *Imaginary Geometry* (original in Russian, 1835); *New Principles of Geometry, with a Complete Theory of Parallels* (original in Russian, 1835–38); *Geometrische Untersuchungen zur Theorie der Parallellinien* (original in German, 1840; new Ger. ed., 1887; Eng. trans., 1891); *Pangéométrie ou précis fondé sur une théorie générale et rigoureuse des parallèles* (original in French, 1855). His complete works were edited by Janischevsky (1870) and have been translated by Hoüel, Battaglini, and Halsted. A collection of his geometrical writings appeared in Kazan. The first volume of this collection, published in 1883, contains Lobachevsky's Russian articles only and bears a Russian title; the second and last volume, published in 1886, contains his French and German articles, and, besides the Russian title, bears also the following title in French: *Collection complète des œuvres géométriques de N. I. Lobatcheffsky.* Consult: Jules Hoüel, in the *Bulletin des sciences mathématiques* (Paris, 1879); V. P. Vassilieff, *Eloge historique de Nicolas Lobatchevsky* (Eng. trans., Austin, Tex., 1894); Engel, *N. I. Lobatchewsky* (Leipzig, 1899). For his geometry, consult *New Principles of Geometry, with Complete Theory of Parallels,* translated from the Russian by Halsted (Austin, Tex., 1897).

LOBANOV-ROSTOVSKI, lō-bä′nŏf-rō-stŏf′skē, Prince Alexei Borisovitch (1825–96). A Russian statesman. He entered one of the departments of the Ministry of Foreign Affairs in 1844, became attaché of the Russian Embassy at Berlin in 1850, and at the close of the Crimean War became counsel to the Legation at Constantinople, where he was afterward Minister Plenipotentiary from 1859 to 1863. A scandal interrupted his diplomatic career for several years, after which he reëntered public service in the Department of the Interior as Governor of Orel in 1866 and was Assistant Secretary of War in 1867–68. He represented his government at Constantinople, 1878–79; London, 1879–82; and Vienna, 1882–95. In January, 1895, he was appointed Minister Plenipotentiary to Germany, but never started for Berlin, as on the death of M. de Giers he became Minister of Foreign Affairs on February 26 (March 10) of the same year. His policy was vigorous. He died suddenly while traveling to Kiev, Aug. 30, 1896.

LOBAU, lō′bou. An island about 5 miles below Vienna, in the Danube, noted for its connection with the battle of Aspern and Essling, between Napoleon I and the Austrians under Archduke Charles (May 21–22, 1809). From Lobau Napoleon threw bridges across both arms of the Danube, and crossed to the left bank on the 21st. On the night of the 22d the defeated French regained the island and held it until July 4, when the river was again crossed, and the battle of Wagram was won on July 6. For his brilliant work in retaking this island, Gen. Georges Mouton was created Count de Lobau (q.v.) by Napoleon.

LOBAU, lō′bō′, Georges Mouton, Count de (1770–1838). A marshal of France. He was born Feb. 21, 1770, of an obscure family at Pfalzburg in Lorraine. In 1792 he entered the army as a volunteer and served with distinction in the armies of the North and of Italy, becoming in 1799 aid-de-camp to Joubert. In 1800 he became a colonel. Later he attracted the attention of Napoleon, who made him in 1805 his own aid-de-camp, and in this capacity he served during Napoleon's campaigns in Germany. In 1807 he became a general of division and in 1808 he commanded a division in the campaign in Spain. In 1809 he returned to Germany and distinguished himself especially at Landshut and in the battle of Aspern (q.v.), where his brilliant assault on the village of Essling enabled the French to recross the Danube in safety to the island of Lobau, for which service Napoleon created him Count de Lobau and adjutant general. He was taken prisoner by the allied forces after the battle of Leipzig (1813) and returned to France only after the First Restoration. Having supported Napoleon after his escape from Elba and fought at Ligny and Waterloo, he was not allowed to return to France until 1818. After the revolution of 1830 he became commander in chief of the National Guard and was made marshal and peer of France in 1831.

LOB′BY (ML. *lobia*, *lobium*, *laubia*, from OHG. *loubā*, Ger. *Laube*, arbor, from OHG. *loub*, Ger. *Laub*, leaf). That part of the assembly hall of a legislative body where private persons are permitted to enter for the purpose of consulting with members. In the political vocabulary of the United States the term refers also to the persons who frequent this place for the purpose of influencing the votes of legislators. They are called "lobbyists" and their business "lobbying." One of the leading causes of the lobby in the United States is the method of legislation by committees, bills being first discussed by small committees and frequently approved by the legislature after little or no public debate. It may thus happen that a measure of importance to an individual or corporation may be carried through the legislature without arousing the consideration which its real nature demands. This method enables powerful interests to bring pressure to bear upon the legislative committee to induce a favorable report which could not be exerted effectively upon the legislative body as a whole. Corporate interests habitually maintain experienced and influential lobbyists at American legislatures. Several States, notably California and Georgia, have made the business of lobbying a felony. The constitutions of North Dakota and Wyoming declare that the practice of logrolling, which is really a form of lobbying, shall be treated as bribery, while the constitution of South Dakota requires of every member of the Legislature an oath that he has not accepted a free pass on a railroad for any vote which he may cast or influence which he may exercise in the enactment of any law. The New York law of 1906 requiring agents and attorneys representing the interests of corporations before the Legislature to file application with the Secretary of State, setting forth in detail the services they expect to perform, and to make public a sworn statement of all expenses incurred in the performance of such services, is designed to check illegitimate lobbying by corporation agents and all others who thus seek to influence legislation. The courts have repeatedly held that contracts which may have for their object the influencing of legislation in any other than the recognized and legitimate mode must be held void.

Bibliography. Cooley, *Treatise on Constitutional Limitations which Rest upon the Legislative Power of the States of the American Union* (Boston, 1868); H. C. Tanner, *The Lobby and Public Men* (Albany, 1888); P. S. Reinsch, *American Legislatures and Legislative Methods* (New York, 1907); Bryce, *The American Commonwealth* (App., 2 vols., ib., 1910); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. ii (ib., 1914); also *First Report of the Interstate Commerce Commission* (Washington, 1887).

LOBE, lō′be, JOHANN CHRISTIAN (1797–1881). A German musician, composer, and writer on musical topics, born at Weimar. He studied the flute and violin, as a pupil of August Riemann and later of A. E. Müller, appeared in 1811 as a solo flutist at the Leipzig Gewandhaus, and became flutist and subsequently viola player in the Weimar grand-ducal orchestra. In 1841–45 he conducted at Weimar an institute for theoretical instruction in music and in 1846 established an institute of music at Leipzig, where he also edited the *Allgemeine Musikalische Zeitung* until it ceased publication in 1848. From 1853 to 1857 he published and edited the *Fliegende Blätter für Musik* and later was musical editor of the *Illustrirte Zeitung* of Leipzig. He also became well known as a writer of sarcastic and witty feuilletons. His compositions, including six operas, two symphonies, quartets for pianoforte and strings, and a number of flute solos, are technically skillful and finished, but rather commonplace in their material. His *Katechismus der Musik* (1851, revised in 1913 by H. Leichtentritt, also in English translation by F. R. Ritter, 1894) is still a valuable book. His most ambitious work, *Lehrbuch der musikalischen Komposition*, in four volumes (1850–67), frequently revised and translated into many languages, enjoyed enormous popularity.

LÖBE, lẽ′be, WILLIAM (1815–91). A German agricultural writer, born at Treben, Saxe-Altenburg. For many years he was a farmer, but in 1840 he removed to Leipzig and began to write on agricultural subjects. Among his numerous works are: *Encyklopädie der gesamten Landwirtschaft* (6 vols., 1850–52; Supp., 1860); *Handbuch der rationellen Landwirtschaft* (7th ed., 1887); *Die Milchwirtschaft* (2d ed., 1889); *Die Geflügelzucht* (4th ed., 1903).

LOBECK, lō′bĕk, CHRISTIAN AUGUST (1781–1860). A German classical scholar. He was born at Naumburg-an-der-Saale, and, after studying at Jena and Leipzig, was professor extraordinarius at Wittenberg from 1810 to 1814, when he became librarian and professor ordinarius of ancient literature and eloquence at Königsberg. He retained the latter post until 1858. He is remembered chiefly for his contributions to the study of Greek grammar and Greek mythology and religion. Among his works were the *Paralipomena Grammaticæ Græcæ* (2 vols., 1837); *Pathologiæ Sermonis Græci Prolegomena* (1843); and the *Aglaophamus, seu de Theologiæ Mysticæ Græcorum Causis* (2 vols., 1829), which is particularly valued for its accurate and exhaustive discussion of the Orphic sect and literature; in opposition to the views of Creuzer (q.v.), in his *Symbolik*, Lobeck in the *Aglaophamus* set forth the actual facts known concerning the mysteries. He also edited some Greek texts, including the *Ajax* (*Aἴας*) of Sophocles, with a commentary (1810; 3d ed., 1866). He made valuable additions to the Greek grammar by Buttmann (q.v.). His selected academic speeches were published by Lehnerdt (1865). Consult: Ludwig Friedländer, *Mitteilungen aus Lobecks Briefwechsel* (Leipzig, 1861); Ludwig, *Ausgewählte Briefe von und an Chr. Aug. Lobeck und K. Lehrs* (Leipzig, 1894); J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

LOBEIRA, lō-bā′ē-rȧ, VASCO DE (?–?1403). A Portuguese knight who won his spurs in the reign of John I (1385–1433) or in that of Ferdinand II. Fernão Lopes, the chronicler who recorded this, contradicts himself. Lobeira's greatest title to fame is probably undeserved, for more recent investigation tends to deny him the authorship of the romance of *Amadis of Gaul*, which may rather have been written by his father, João Lobeira.

Bibliography. Jorge Cardoso, *Agiologio Lusitano dos Sanctos e Varões illustres em virtude do reino de Portugal e suas conquistas*, vol. i (Lisbon, 1652); Ludwig Braunfels, *Kritischer Versuch über den Amadis von Gallien* (Leipzig, 1876); C. M. de Vasconcellos, "Portugiesische Litteratur," in Gustav Gröber, *Grundriss der romanischen Philologie*, vol ii (Strassburg, 1897); C. M. de Vasconcellos, *Cancioneiro de Ayuda* (Halle, 1904); A. Thomaz Pires, *Vasco de Lobeira* (Elvas, 1905); M. Menéndez y Pelayo, *Orígenes de la novela*, vol. i (Madrid, 1905); G. S. Williams, "The Amadis Question," in *Revue Hispanique*, vol. xxi (New York, 1909).

LOBEL, lō-bĕl′, DE LOBEL, or LOBELIUS, MATTHIAS (1538–1616). A Flemish botanist. He was born at Lille and was educated as a physician. He traveled through Europe and afterward was appointed botanist and physician to James I of England. The genus of plants called *Lobelia* was named after him. He was author of *Stirpium Adversaria Nova* (1570), *Plantarum seu Stirpium Historia* (1576), and *Icones Stirpium* (1581).

LOBELIA (Neo-Lat., named in honor of Matthias von Lobel). A genus of about 250 species, widely distributed, about 30 species occurring in the United States. Some of them are aquatic, but the large majority are terrestrial plants of wet or dry soil. The conspicuous representatives of the genus throughout the eastern United States are *Lobelia cardinalis* (cardinal flower), with very showy scarlet flowers; *Lobelia syphilitica* (great lobelia), with large clusters of conspicuous blue flowers; and *Lobelia inflata* (Indian tobacco), which occurs in fields and thickets, usually in dry soil, and has been used as a medicine from time immemorial by the aborigines of North America and was introduced into Europe in 1829 by Dr. Reece. The chemical constituents of *Lobelia* are an alkaloid, lobelin, a peculiar acid, to which the term "lobelic acid" has been applied, inflatin, lobelacrin, etc. Several species are cultivated for ornament.

LOBELIA INFLATA, INDIAN TOBACCO.

LOBENGULA, lō′bĕn-gōō′lȧ (c.1833–94). A king of the Matabele. He succeeded his father, Mosilikatse, in 1870, made Buluwayo his capital, and boldly opposed European civilization, threatening with death any of his people who accepted Christianity. He had about 10 conquered tribes under him. After the discovery of gold in his territory (1872), Portugal, the Transvaal, and Great Britain strove to win supreme control over Lobengula's kingdom. In 1888 he signed a treaty with England admitting her suzerainty. Two years afterward the British South Africa Company obtained permission to settle in Mashonaland, and for three years it paid the King a yearly rent. But in 1893, provoked by the insolence of the company, Lobengula attacked the English. He was terribly beaten; his capital was taken; and in his flight, after ambuscading and annihilating a small force under Major Wilson, he was himself killed. Consult Wills and Collingridge, *The Downfall of Lobengula* (London, 1894). See RHODESIA.

LOBETANZ, lō′be-tänts′. An opera by Thuille (q.v.), first produced in Karlsruhe, Feb. 6, 1898; in the United States, Nov. 18, 1911 (New York).

LO′BITO BAY. A seaport and railroad terminus in Angola, Portuguese West Africa. The town has a good harbor, with deep water to within a few feet of the shore, and a wharf alongside of which ocean-going vessels are able to lie. Its chief importance is as the terminus of the Lobito Bay-Katanga Railroad, which links up with the Cape to Cairo Railroad at Katanga and taps a very rich mining centre in Central Africa. Of the 1200 miles of this system, 224 have been completed and are open to traffic. When completed, this route will shorten the distance from England to Central Africa and Northern Rhodesia by over 3000 miles and this will compel a considerable volume of passenger and goods traffic to flow through the port.

LOB′LOLLY BAY. A North American tree. See GORDONIA.

LOBLOLLY PINE. See PINE (Illustration).

LOB-NOR, lŏb′-nōr′. A lake in Central Asia, situated in the eastern part of East Turkestan, at the northern base of the Altyn Tagh Mountains, and surrounded by the great Central Asian desert (Map: China, F 4). It is the sink of the Tarim, the principal river traversing the desert of East Turkestan. Przhevalski believed that Karakoshun was the shrunken remnant of an expanded Lob-Nor of ancient times; Hedin believed that no change had taken place in either lake during historic times; in 1905 Huntington visited the lake and supported largely the views of Przhevalski. Old Chinese records seem to indicate that a large lake once covered the area. The basins nearest the river contain fresh water, while the farthest sinks are salt, and all are surrounded by marshy, reedy tracts.

LO′BO, FRANCISCO RODRIGUES (?1575–?1627). A Portuguese pastoral writer, of whose life we know practically nothing, except that he was born of noble and wealthy parents at Leiria, where he lived comfortably, and that, after studying the humanities and philosophy at Coimbra, he received his degree of licentiate about 1600. His first book, a small volume of ballads (1596), and his last, a welcome in verse to Philip III (1623), are written in Spanish. Despite the vogue of Spanish during the 60 years of the Spanish rule of Portugal (1580–1640), he wrote all the rest of his works in Portuguese, and thereby exerted a powerful influence upon Portuguese literature. His novel *A Primavera* appeared in 1601 and was continued by a second and a third part known respectively as *O Pastor Peregrino* (1608) and *O Desenganado* (1614). These are considered his best prose works, and they contain some delightful *serranillas* that are among the best poems that he ever wrote. His eclogues in imitation of Camões are weak, whereas his *redondillas* prove that he was at his best when he relied upon native and traditional inspiration. In 1619 he produced an interesting dialogue, *Côrte na Aldêa*, but his epic, *El Condestable de Portugal* (1610), in honor of Nuno Alvares Pereira, the hero of the fourteenth-century struggle of Portugal for independence from Spain, is tame. Consult his collected works (1 vol., Lisbon, 1723; less complete ed., 4 vols., ib., 1774); J. M. da Costa e Silva, *Ensaio biographico critico*, vol. v, pp. 5–112 (ib., 1855), for examination of the works; Friedrich Bouterwek, *History of Portuguese Literature* (London, 1823); I. F. da Silva, *Diccionario bibliographico portuguez*, vols. iii, ix (Lisbon, 1859, 1870), for other biobibliographical information.

LOBO, Jeronimo (1593–1678). A Portuguese missionary to Abyssinia. He was born at Lisbon, joined the Jesuits in 1609, and became professor at the College of Coimbra, where he was teaching, in 1621, when he was sent by his superiors as a missionary to India. He arrived at Goa late in 1622 and in 1624 made a first attempt to get into Abyssinia. Again he set out for Abyssinia in 1625 and carried on successful mission work there for many years. Expelled from the country on the death of the Christian King, he returned to Europe and sought to stir up Spain and the Pope against the Abyssinians. Failing, he went again (1640) to India, where he became rector Jesuit provincial of Goa. In 1656 he was back at Lisbon, where he spent the rest of his life engaged in literary pursuits. He wrote in Portuguese an account of his journeyings that seems never to have been published. In manuscript form, however, it served as the basis for Balthazar Telles's *Historia geral da Ethiopia a Alta* (Coimbra, 1660); and from the manuscript copy the Abbé Joachim Le Grand made his French translation in 1728, under the title of *Voyage historique d'Abissinie*. An English abridgment of LeGrand's edition was made by Dr. Johnson in 1735 and reprinted in 1789.

LOBOC, lō-bŏk′. A town of the island of Bohol, Philippines, situated on the Rio Soca, 4 miles from the south coast and 12 miles east of Tagbilaran. Pop., 1903, 10,756.

LOBOS (lō′bōs) **ISLANDS,** or Seal Islands. Two small groups of rocky islands off the coast of Peru, famous for the great quantity of guano which they contain. The largest island of the northern group, Lobos de Tierra, lies in lat. 6° 29′ S., 12 miles from the mainland, and is about 5 miles long and 2 miles broad; the southern group, Lobos de Afuerra, lies about 25 miles farther south. More than 8,000,000 tons of guano have been exported.

LOBSTEIN, lŏp′stīn, Paul (1850–). A German Protestant theologian, born at Epinal (Vosges). He studied theology at Strassburg, Tübingen, and Göttingen, was appointed a lecturer in the theological faculty at Strassburg in 1876, received a professorship there in 1877, and from 1884 held the chair of dogmatics. His theological views became those of the school of Albrecht Ritschl (q.v.). His publications include: *Die Ethik Calvins* (1877); *Petrus Ramus als Theolog* (1878); *La doctrine de la Sainte Cène* (1889); *Etudes christologiques* (1890–94); *Die Lehre von der übernatürlich Geburt Christi* (1896; Eng. trans., *The Virgin Birth of Christ*, New York, 1903); *Einleitung in die evangelischen Dogmatik* (1896; Eng. trans., *Introduction to Protestant Dogmatics*, Chicago, 1910); *Voltaire et la christianisme* (1901); *Wahrheit und Dichtung in unsere religion* (1904); *Etudes sur la notion chrétienne de Dieu* (1907); *Calvin und Montaigne* (1909); *Quelques enseignements du modernisme* (1911). He also contributed to the *Revue Chrétienne* and to Lichtenberger's *Encyclopédie des sciences religieuses*.

LOB′STER. The largest of crustaceans (*Homarus americanus*), standing at the head of the macrouran decapods. (See Crustacea.) Its allies are the shrimps, prawns, and especially the crayfish. In all of these the head and thorax are united into one region, the cephalothorax, covered by the shield or carapace. The body of the lobster consists of 19 segments, of which the 6 in the abdomen are distinct, while the 13 others, forming the thorax and head, are more or less fused together. There are two pairs of antennæ, a pair of mandibles, two pairs of maxillæ or foot jaws, and three pairs of accessory foot jaws or maxillipeds. The first pair of legs (chelipeds) end in the large chelate or nipper-like claws. The smaller of the large claws (fish claw or quick claw) is slender, toothed, and incurved at the tips, so that lobsters seize fish and shells and grapple with one another. The other claw is thick and heavy, adapted for crushing heavy objects, and is called the club, knobbed, or numb claw. Variations occur in the position of these claws, being either on the right or left side. Lobsters have been observed to transport small stones in their claws while engaged in burrowing. The abdominal legs are, with the exception of the first pair, two-branched and called the swimming legs, or swimmerets. Of these the first pair are slender and not divided in the female, while in the male they are much larger, thicker, and modified to serve as pairing organs, forming when placed together a funnel-like apparatus through which the spermatophores pass into the openings of the oviducts. The last pair of appendages are very broad and are attached to the sixth segment. With the telson or terminal joint (which is not a true segment) they form a swimming organ.

The eyes are large, compound, situated at the end of thick, movable stalks, supposed by some to be homologous with appendages. As to the visual powers of the lobster we know very little. Judging by experiments made on insects with similar faceted eyes, they are probably near-sighted and depend more on perceiving the movements of other animals than clearly distinguishing their definite outlines. The statocyst is a membranous sac indicated by a clear oval space on the upper side of the basal joint of the first antenna, containing a series of delicate feathery hairs arising from a ridge and provided each with a nerve. The wall of the sac is penetrated by a slit through which pass water and minute grains of sand. This was formerly regarded as an ear, but there is experimental evidence that it is an organ of equilibrium.

Little is known with certainty of the senses of taste and smell. Herrick states that the entire body is sensitive, the organs being the soft setæ and the "tegumental glands," these latter being especially numerous on the upper lip. The greatest sensitiveness is in the antennules. Lobsters are sensitive to light and are much more active at night than by day, seeking food or their mates in the darkness.

Habits. The food of the lobster is living as well as dead fish, the usual bait for lobster traps being fresh dead fish. The food is comminuted by the "gastric mill," an arrangement of hard teeth on the wall of the stomach. By a system of "strainers" part is sent into the intestine and part into the liver, digestion taking place in both organs. The intestine opens externally on the underside of the telson. Lobsters are known to live on snails, breaking off the shell of large ones piece by piece and picking out the soft parts, or swallowing small ones whole.

It is known that lobsters are very active and may, if transported several miles from their original habitat, find their way back. Several lots of lobsters marked with a tag were liberated at Woods Hole, Mass., after they were stripped of their eggs. They all moved towards the southwest. One made the journey from Woods Hole to Cuttyhunk, a distance of 12 miles, in three days. One traveled 16 miles in 27 days. Whether this migration is due to the so-called homing instinct, or that they are impelled to seek cooler water, remains to be seen; none moved northward up Buzzards Bay into the warmer waters. As is well known, the lobster can shoot backward to a considerable distance by suddenly flexing the abdomen under the cephalothorax, going, according to Herrick, "25 feet in less than a second."

The geographical range of the lobster is from Henley Harbor, Labrador, at the eastern mouth of the Strait of Belle Isle, southward to Delaware Bay, though stragglers have been found off Cape Hatteras in 30 fathoms and at Beaufort, N. C. They have been captured on the fishing banks of the bays of Maine and Nova Scotia, and have been taken from the stomachs of cod caught on George's Bank. They are usually, however, found near rocky shores below low-water mark to a depth of 10 to 20 fathoms; towards winter they migrate into water from 35 to 40 fathoms deep. They are bottom feeders, never rising more than a few feet above the bottom.

In walking they rest on the tips of the slender legs, extending the large claws forward in front of the head; while the swimming feet aid in progression. They are said to catch the sculpin and sea robin, and are supposed not infrequently to catch other fish.

Reproduction and Breeding Habits. The ovaries (coral) and corresponding male glands are voluminous organs, the testes being white, the ovaries, when the lobster is about to spawn, being dark green, and the ovarian eggs quite distinct. The eggs pass out of an opening on the basal joint of the next to the last pair of walking legs; the seminal ducts in the male open on the basal joint of each of the last or fifth pair of legs. Pairing has never been observed, but it is known to take place in spring and summer. The breeding season is in July and August, though the eggs may be laid in the spring or autumn, and even in winter. The eggs are extruded and carried on the underside of the abdomen, attached by a cement in bunches to the hairs of the swimming legs, the process taking place most probably in the night or early morning. The number of eggs laid is estimated to vary from 5000 to 80,000, and in some cases even to 100,000. The average number of eggs laid by a lobster 8 inches long, when sexually mature and "in berry" or carrying eggs, is 5000; a 10-inch lobster bears about twice as many eggs, and one of 12 inches carries double the number borne by one which measures 10 inches. When the 14 to 16 inch limit is reached there is a decline in sexual vigor. Female lobsters become sexually mature when from 8 to 12 inches in length. The variation in the number of eggs borne by lobsters of the same length is often very great.

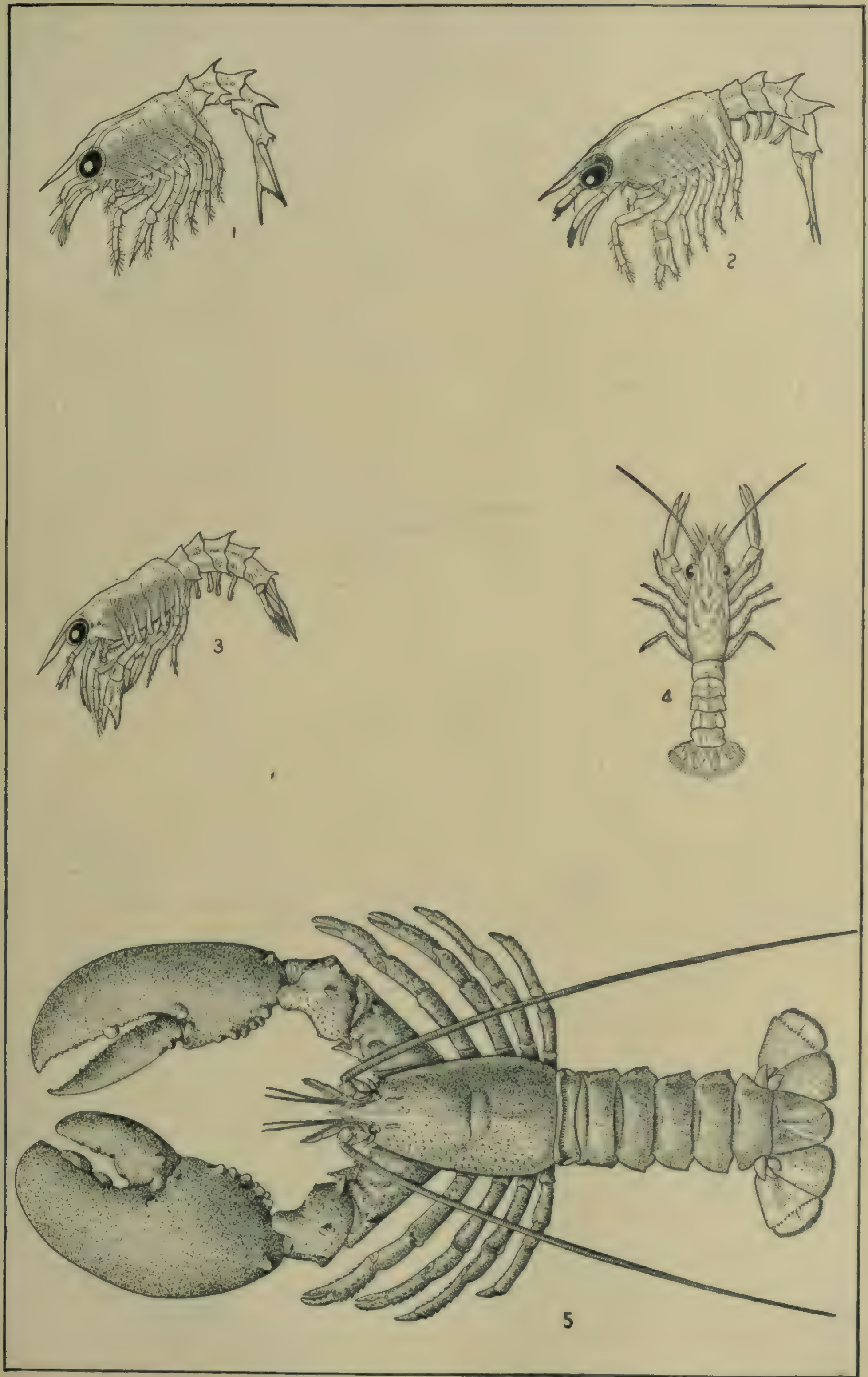
Embryology and Metamorphosis. The lobster has a much shorter larval life than most decapod crustacea, and its development is in fact direct, its metamorphosis being incomplete. The period of incubation at Woods Hole is about 10 months, from the middle of July or August to the middle of the following May or June. In one case the eggs were carried 335 days, from July 1, 1890, to June 1, 1891. The yolk segments in about 24 hours after oviposition, and the embryo passes through the nauplius condition in 10 days, and when from 26 to 28 days old the eye pigment can be seen at the surface. The process of hatching for all the eggs borne by one female requires about a week.

The young on hatching are driven away by the fanning motion of the parent, and in May, June, and July they swim at the surface. During this time and until the fourth stage is reached immense numbers are devoured by surface-swimming fish and other animals. Herrick states that a survival of two in every 10,000 larvæ hatched would maintain the species at an equilibrium, and the destruction of the young under the present conditions of the fishery is probably even greater than this implies. In the first stage (Fig. 1), which lasts from one to four or five days, the length of the body being a little over one-third of an inch (7.84 millimeters), there are no abdominal appendages, and the two pairs of antennæ are short and thick. It now differs, however, from the larva (zoëa) of most shrimps and crabs in having the full complement of thoracic legs. In the second stage, which lasts from two to five days, the length being 9.2 millimeters, four pairs of swimmerets have appeared, and in the third stage the last pair of abdominal legs (uropods) arise. This stage lasts from two to eight days, its body being 11.1 millimeters in length.

In Narragansett Bay (Wickford) the average period for hatching and reaching the fourth stage was a little over 12 days. The length of the fourth stage varies from 10 to 19 days; and during this period the larva is about one-half of an inch (12.5 millimeters) in length.

After the third molt the young lobster or lobsterling (Fig. 4) assumes the shape and habits of the adult. Its body becomes heavier, the chelæ of the first pair of feet are held straight out, and after living at the surface from six to eight weeks it sinks to the bottom, over which it crawls, and now the habits change. The young lobster, previously without

LOBSTER



METAMORPHOSIS OF THE LOBSTER

1, 2, 3, Successive stages in larval development. 4. Young lobster in fully developed form. 5. An old adult.

fear and moving aimlessly about at the surface, now appears timid and retreats from danger, as does the adult; after reaching the bottom it travels towards the shore, burrows in the sand at the bottom under stones, and takes every precaution to avoid its enemies. Its natural food consists of minute crustaceans (copepods), and when food is scarce its own brethren, as it is atrociously cannibalistic.

Molting. The periodical shedding of the skin begins when the lobsterlings are two or three days old and continues throughout life, the intervals between the successive castings of the shell growing longer with age. It molts from 14 to 17 times during the first year of its life. After sexual maturity ecdysis may not occur more than once a year; a 10½-inch lobster has molted from 25 to 26 times.

In the first molts, as in those succeeding, the process is the same, the old skin being split across the back, between the hinder edge of the shield or carapace and the abdomen; the carapace is raised up behind, the body being gradually drawn out through the gaping opening. In adult lobsters the withdrawal of the contents of the big claws is facilitated by the partial absorption of the lime in the shell of the narrow part of the base of the leg, so that the integument can be distended. The muscles at this time are greatly stretched, while their action is probably aided by the removal of water from the blood (Vitzou). During the process the stomach with the solid teeth, as well as the chitinous lining of the œsophagus and intestine, are cast off with the entire integument, including the finest hairs fringing the appendages. "Shedders" are those with shells hard and dull previous to shedding or casting their shell, while soft-shelled lobsters are those which have recently exuviated. The process occupies but a few minutes, unless through weakness it is delayed. The period of shedding is, as in insects and other animals, a precarious one, and sometimes the animal dies during the process; both in the larval and adult stages growth or increase in size takes place while the new shell is being formed, and not immediately after ecdysis (Herrick). The increase in length of a lobster 5½ inches long is 1 inch; in one 11¼ inches long 1¼ inches. The appearance of sudden growth is due to the absorption of water, not cellular growth. After molting it is several weeks before the new shell is as hard as the old one.

Rate of Growth. Our knowledge of the rate of growth of lobsters is not definite, but it is known that this rate varies enormously in different individuals reared in confinement in the same car under apparently the same conditions. Lobsterlings of the same age will measure from 2¾ to 5 inches. It is probable that the length of 9 inches is not usually attained before the fourth year. The variations in growth are so great that "it will never be possible to tell the age of a larger lobster from its length." A 10½-inch lobster is about five years old. The largest recorded lobsters weighed 31 and 34 pounds respectively and were caught off the New Jersey coast in 1897.

Economic Importance. Of the annual yield of lobsters on the Atlantic coast of the United States, 70 per cent is from the waters of Maine. In 1880 the total yield of the United States was over 20,000,000 pounds, and in 1889 this had risen to over 30,000,000, but that was the high-water mark of lobster production. In 1898 it was 14,661,808 pounds; in 1905, 11,898,136; in 1908, 15,279,900; and in 1913 only 12,267,017. But while there has been this immense decrease in amount, the ever-increasing demand has steadily raised the price, so that the value of the catch in 1898 was more than $1,276,000; in 1905, $1,364,721; in 1908, $1,931,100; in 1913, $2,394,822; while in 1889 it was about $860,000. In 1880 the Massachusetts catch was over 4,300,000 pounds, worth about $158,000, or about 3.6 cents per pound; in 1898 it had fallen to less than 1,700,000 pounds, worth less than $148,000, or about 8.7 cents per pound; in 1905 it was 1,283,071 pounds, with a value of $176,234, or about 14 cents a pound; and in 1913 it amounted to 1,524,389 pounds, with a value of $290,423, or 19 cents a pound.

Efforts to maintain the lobster fisheries in an economically valuable condition have been made along two lines: legislation specifying the size that may be legally taken and artificial propagation. A short lobster is one measuring (the usage varying in different States) either less than 9 or less than 10½ inches from the spine on the head to the end of the telson. If caught in traps they must be returned to the water, and it is illegal to have them in possession. The law is difficult of enforcement and probably has little effect on the fisheries. In Massachusetts a recent law allows the taking of short lobsters and provides that female lobsters with eggs attached may be taken, but only on condition that they be sold to the State for purposes of propagation.

Artificial propagation consists in taking the eggs from the female and hatching them in specially devised aquaria, as is done with fish, the larvæ being turned loose in the water. Most of this work has been done by the United States Bureau of Fisheries, who reported that, in 1914, 179,990,000 larvæ were liberated. If the larva is liberated earlier than the fourth stage, it swims at the surface and is very probably eaten by fish; but if liberated in the fourth or later stage, it goes to the bottom and hides under stones or in weeds. Since no satisfactory method was known for keeping the larvæ to the fourth stage, the bureau has been obliged to free them earlier, and it is probable that much of this work has been of no value. Important experiments on rearing the young lobster have, however, been conducted by the Rhode Island Fisheries Commission and have demonstrated the possibility of carrying them to the fourth stage in sufficient numbers to be commercially practicable. It seems probable that application of these methods will result in a permanent improvement in the fisheries. Lobsters are caught chiefly by means of traps made of laths and stout cord, into which they are beguiled by a piece of meat or fish. These traps are usually 3 or 4 feet long and capable of containing a number of lobsters. They are set in water ranging from 5 to 6 up to 30 fathoms or even more, and are visited every two or three days, if the weather permits. From the traps the lobsters are taken to floating cages, called cars, where they are kept until enough are gathered to warrant a shipment.

Bibliography. H. C. Bumpus, "The Embryology of the American Lobster," in *Journal of Morphology*, vol. v (Chicago, 1891); F. H. Herrick, *The American Lobster: A Study of its Habits and Development* (Washington, 1895); A. D. Mead, *Method of Lobster Culture* (ib.,

1910); F. H. Herrick, *Natural History of the American Lobster* (ib., 1911); E. W. Barnes, *Methods of Protecting and Propagating the Lobster, with a Brief Outline of its Natural History* (rev. ed., Providence, 1911).

LOB′WORM′ (from *lob*, probably from Welsh *llob*, dolt + *worm*), or Lugworm. A chætopod worm (*Arenicola piscatorium*), used by British anglers as a bait. It lives in deep burrows hollowed out of the sand on the seashore, eating its way and passing the sand through the alimentary canal to extract whatever nutriment it may contain. It has a large head without eyes or jaws, a short proboscis, and 13 pairs of gills, placed on each side of the middle of the body. It reaches a length of nearly a foot. Another species (*Arenicola cristata*) is found on the coast of eastern North America, and others on the Pacific coast.

LOCAL ACT or **STATUTE.** A legislative enactment which is made applicable only to a subordinate area or division of a state, as a given county, city, or town. An act or statute applying to the whole state is known as a *general* act. See Act; Statute; Legislature.

LOCAL ACTION. See Voltaic Cell or Battery.

LOCAL′ITY, Perception of. All perceptions are more or less definitely localized. Our visual perceptions occupy positions in space; when we are touched upon the skin we perceive a pressure localized on the surface stimulated; we are able to describe the position of our limbs while they are concealed from our view; taste and thirst are localized in the mouth; even odors and sounds are localized in space, though with less immediacy and definiteness than other perceptual stimuli. Furthermore, we are able to say, not only that a stimulus occupies such and such a position in the field (absolute localization), but also, and especially in the case of visual and cutaneous perceptions, that the stimulus occupies a position relative to other stimuli in that field (relative localization).

Our various modes of perception differ greatly as regards these two kinds of localization. In visual perception we habitually localize stimuli with reference to other stimuli in the field, and relative localization is highly developed. The ability to discriminate the difference between points in space is measured in terms of the visual angle or the distance between the two retinal images; and experiments show that we can distinguish such a difference in the transverse plane when the two retinal images are about .004 millimeter apart (visual angle about 1′). Discrimination in the median plane, relative discrimination of depth, is possible when there is a difference of 5″ in the position of the retinal images of the two eyes. If, however, a single point is set against a uniform background it is localized as distant, but with considerable error. When we turn to the cutaneous perceptions we find the matter reversed. The absolute localization of a pressure on the skin, although it varies with the part stimulated, is fairly accurate; e.g., on the wrist the average error of localization is from 5 to 10 millimeters. But if we stimulate the skin with two points, commencing with a separation of 1 millimeter, and gradually increasing it by small steps, we find that the two points are at first perceived as one; then, with greater separation of the stimuli, as a circle; then as a thickish line; then as two circles connected by a line; and finally as two discrete points. The two points are now perceived as different; yet their relative position, in the longitudinal or transverse direction, is not perceived until the difference between the two stimuli is still further increased. It is apparent, therefore, that the relative localization of two points is not so highly organized in cutaneous perception as is the case in visual perception. The two-point limen (see Extension; Limen) for pressure varies at different regions of the cutaneous surface; it is smaller than that for cold or warmth. If we isolate pressure spots, and determine the distance at which they are perceived as two with simultaneous stimulation, it is found that the separations are smaller than the usual two-point limens: the value for pressure spots on the back of the hand has been found to be 0.3 millimeter, upon the forehead 0.5 millimeter, upon the chest 0.8 millimeter, and upon the back 4 millimeters. The values for cold spots in the same cutaneous areas were 2, 0.8, 2, and 1.5 millimeters; for warmth, 3, 4, 4, and 4 millimeters. The movement limen, or the least noticeable difference in the position of a limb, depends upon the joint in which the movement takes place. The larger joints have, as a rule, the smaller limens; the hip is noticeably more sensitive than the ankle (0.5° and 1° respectively). Recent experiments on the localization of sensations within the body show that mechanical and electrical stimulations of the œsophagus are in general referred either to the region below the sternum or to the throat, and that pressures in the stomach are localized within the trunk but at points below the actual position of the stomach.

In all these instances the perception is effected by way of secondary criteria—visual imagery, movements towards the part stimulated, the touching off of a verbal response, etc. The question now arises: How can we account for this unequivocal relation? How does it happen that a touch upon the back of the hand, when the eyes are closed, arouses just the visual idea of this part of the skin and no other, just the particular name of this cutaneous area, or just the one special movement? Historically, the most noteworthy answer to this question is Lotze's *theory of local signs*. It is supposed that every cutaneous sensation has, in addition to its specific quality (pressure, warmth, etc.), a peculiar qualitative coloring which is the sign of its locality. It is pointed out that the skin differs in structure at different parts of the body—"now covered by a thick and now by a delicate epidermis; now spread over a cushion of fat, now passing over bone or muscle." These differences, however, are of a sort to condition differences in the intensity, rather than in the quality, of the impression. Moreover, if we take two symmetrical areas, e.g., the backs of the right and the left hands, where the anatomical conditions are very similar, a unilateral stimulation is immediately localized as right or left; whereas, on the basis of the theory, localization should be difficult. Lastly, observation reveals no qualitative difference of impressions that could serve as basis for local signature. Hence we must probably regard the secondary criteria themselves as local signs, and must believe that they are the product of long development in the history both of the individual and of the race. Visual, cutaneous, and articular sensations appear to possess the attribute of extent (q.v.), and this gives us a starting point. Our vision is, further, (1) binocular, and the fusion of the two monocular fields gives us the indefinite perception of depth; (2) the eyes are constantly moving, so that associations are set up between visual sensations and the sensations from the muscles of convergence and accommodation; (3) and finally, such secondary criteria as the distribution of light and shade, linear perspective, aërial perspective, etc., furnish cues to nervous habits which are immediately realized in the perception of locality. A similar process obtains in the case of cutaneous sensation: we are moving organisms, and the transition from bidimensional to tridimensional space is doubtless facilitated by the organism's ability to move and fold the skin upon itself—by the crossing of arms and legs, the exploration by the hand of an object held to the breast, etc. Definite associative tendencies are thus set up between pressures, warmths, colds, and muscular sensations, and again between these and visual sensations.

There remains to mention the secondary spatial localization of odors and sounds. That of odors is vague and uncertain; we turn the head in the direction which affords the most intensive perception, and we refer the position of the stimulus to that direction. The localization of sounds is more accurate; the most important clew is the inequality of the intensity of the sound as heard by the two ears, so that the greatest errors of localization occur when the source of the sound lies in the median (sagittal) plane. Two other factors, of less importance, are the absolute intensity of the sound and its complexity: the tones of musical instruments, noises, etc., are localized with greater accuracy than are pure tones.

For a more detailed account of the perception of locality in the third dimension, see DISTANCE or DEPTH. Consult: R. H. Lotze, *Medizinische Psychologie* (Leipzig, 1852); Oswald Kuelpe, *Outlines of Psychology* (New York, 1909); E. B. Titchener, *Text-Book of Psychology* (ib., 1910); W. Wundt, *Physiologische Psychologie* (Leipzig, 1910–11); G. T. Ladd and R. S. Woodworth, *Elements of Physiological Psychology* (New York, 1911).

LOCAL OPTION. A system of local control of the liquor traffic. See TEMPERANCE.

LOCAL RANK. A temporary rank or grade bestowed in the British army, during war, which permits an officer of junior absolute rank to perform duties of a much higher or relative rank. The rank is temporary and holds good only in that army, commanded at the time by the commander in chief who grants it, but must be confirmed by the Secretary of State for War.

LOCARNO, lô-kär'nô (Ger. *Luggarus*). A town in the Canton of Ticino, Switzerland, on the north shore of Lake Maggiore (q.v.) at the mouth of the Maggia (Map: Switzerland, C 2). It is connected by a branch railway with the main line of the St. Gotthard system and by regular steamboat service in summer with Arona (q.v.). The pilgrimage church of Madonna del Sasso contains paintings by Bramantino and Ciseri, and on September 8 occurs the great festival of the Nativity of the Virgin. It has manufactures of brushes and candles. Locarno, mentioned in history as early as 789, came into the possession of Milan in 1340 and was ceded to the Swiss in 1512. Its development was arrested by the expulsion of the Protestants in 1553. Pop., 1910, 5638 (mostly Catholic Italians).

LOCATELLI, lō'kȧ-tĕl'lē, PIETRO (1693–1764). An Italian violinist and composer, born at Bergamo. All that is known of his life is that he studied in Rome under Corelli (q.v.) traveled considerably, and finally settled in Amsterdam, where he established regular concerts. He is important not only in the history of the sonata, but also in the development of the violin technic towards real virtuosity. His works consist of numerous concertos and sonatas.

LOCH, lŏk, HENRY BROUGHAM, first BARON (1827–1900). A British colonial official, born at Drylaw, Midlothian. He entered the navy in 1840, but in 1842 was gazetted in the 3d Bengal Cavalry, and he served throughout the Crimean War. He joined Lord Elgin on a special embassy to China in 1857, to Japan in 1858, and again to China in 1860. On the last occasion a terrible imprisonment which he suffered at the hands of the Chinese nearly cost him his life. He served as Governor of the Isle of Man in 1863–82, as Governor of Victoria in 1884–89, and as Governor of Cape Colony and High Commissioner of South Africa in 1889–95. In South Africa he supported Cecil Rhodes's policies; annexed Mashonaland and Matabeleland; and opposed President Kruger of the Transvaal in many disputes. But he did not favor strong measures against the Boers, and this led to his return to England, where he was made a peer.

LOCHABER (lŏk-ä'bẽr) **NO MORE.** A song by Allan Ramsay, first published in his *Tea Table Miscellany*, a collection of English and Scottish songs. The air, for which a Scottish origin has been claimed, is probably Irish and appears as "The Irish Inne" in Thomas Duffet's *New Poems, Songs, Prologues, and Epilogues* (London, 1676). It was also known as "King James's March to Dublin." The melody is attributed in Bunting's *Ancient Music of Ireland* to Myles Reilly of Killincarra, about 1635. Consult *Our Familiar Songs* (New York, 1901).

LOCH EARN. See EARN.

LOCHES, lôsh. An ancient town in the Department of Indre-et-Loire, France, situated on the left bank of the Indre, 29 miles southeast of Tours (Map: France, N., F 5). Its chief point of interest centres in the old castle built by Charles VII and now used for administrative purposes. One of the towers still contains the iron cages which held many famous prisoners during the reign of Louis XI. The castle also contains the tomb of Agnes Sorel, the mistress of Charles VII. Here James V of Scotland was married to Madeleine of France in 1536. The town hall, a Renaissance building of the sixteenth century, and the collegiate church of Saint Ours (tenth to twelfth century) are also noteworthy. Loches produces textiles, liquors, and leather, and trades in agricultural products and horses. It is supposed to occupy the site of a Roman settlement. Pop., 1901, 5161; 1911, 3946.

LOCH GOIL. See GOIL, LOCH.

LOCHIEL, lŏk-ēl'. A Highland chief of Scotland. See CAMERON, DONALD.

LOCHIEL'S WARNING. A poem by Thomas Campbell, the subject of which is Donald, son of Sir Evan Cameron of Lochiel.

LOCHINVAR, lŏk'ĭn-vär'. A well-known ballad, and the name of its hero, in Scott's *Marmion*.

LOCH KATRINE, kăt'rĭn. See KATRINE, LOCH.

LOCHLEVEN. See LEVEN, LOCH.

LOCHLEVEN CASTLE. See Leven, Loch.

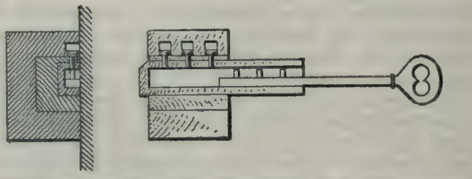
LOCH LOMOND, lŏ′mond. See Lomond, Loch.

LOCHNER, lôG′nẽr, Stephan (?–1451). A German painter, the chief master of the Cologne school. He was born at Meersburg, on Lake Constance. Nothing is known of his training, and little of his life. He came to Cologne about 1426, youthful but already trained, and soon gained great influence over the local school. He is first mentioned in the city records in 1422 and was chosen councilor of the Guild of Painters in 1447 and again in 1450. His earliest-known commission was the fine triptych of the Last Judgment, the central panel of which is in the Cologne Museum, the wings in the Frankfort and Munich galleries. But his masterpiece—and that of the Cologne school—is the triptych known as the Kölner Dombild in Cologne Cathedral. It was not only the greatest work of its day, but one of the finest, if not the finest, of its kind ever painted in Germany. The central panel represents the "Adoration of the Kings," the right wing "St. Ursula with her Maidens," the left, "St. Gereon with the Theban Legion." It was originally painted for the chapel of the Town Hall, where it was seen by Dürer, who mentions it in his diary. Other extant paintings by him are two tablets, each representing three saints, in London and Cologne respectively; "The Madonna with the Violets" (Archiepiscopal Museum, Cologne); the "Madonna in the Rose-Arbor," in the Wallraf-Richartz Museum, Cologne; "Christ and Six Saints," in the Germanic Museum of Nuremberg; and "The Presentation in the Temple" (Darmstadt). The spirit of Lochner's radiant and serene art is essentially Gothic, inspired by a profound religious sentiment. His color is wonderfully brilliant yet soft, his figures dignified and charming, his grouping excellent; but his draftsmanship, especially in the rendering of arms and hands, is often defective. Consult Carl Aldenhoven, *Geschichte der kölner Malerschule* (Lübeck, 1902), and Mela Escherich, *Die Schule von Köln* (Strassburg, 1907).

LOCH TAY. See Tay, Loch.

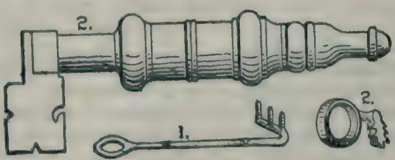
LOCK (AS. *lōc*, from *lūcan*, OHG. *lūkhan*, Goth. *ga-lūkan*, to close; ultimately connected with Lith. *lúzti*, Skt. *ruj*, to break). A contrivance for securely fastening a door, drawer, lid, or other moving part, by means of an inclosed bolt which is shot back and forth by a key or other device to engage with some form of staple, plate, or box. The bolt is usually guarded by an obstacle which must be overcome by the action of the key. Key locks may be divided into two general classes according to the character of the obstacle. 1. *Warded locks* are those in which the obstacle consists of fixed wards or ridges within the lock which prevent the turning of the key unless its grooves or perforations coincide with the wards of the lock. 2. *Tumbler* or *lever locks* are those in which the obstacles are movable levers or pins which must be moved to a certain position before the bolt can slide. In this class of locks the bolt can be actuated only by a properly shaped key, whose indentations, or "bittings," will raise the levers or pins exactly to the proper height. Modern locks include also combination or dial locks, chronometer or time locks, and various kinds of small "keyless" locks. None of these have keys.

Historical Development. Early in the history of civilization wooden bars or bolts were the first means employed to protect crude doors, and from them was developed the primitive lock, which with some means or other for controlling it—or, in other words, a key—we find referred to frequently in ancient literature such as the Odyssey and the Old Testament. Such a device as used in Nineveh actually has been found in one of the palaces of Khorsabad, with a key resembling those still employed in the East. In an ancient Egyptian lock, which figures in the illustration, one may find the fundamental idea of the modern pin-tumbler lock. Here the wooden bar or bolt of the lock was held in closed position by movable pins, which fell from the case into corresponding holes in the bolt, and the latter could not be moved until a key with pegs corresponding to the holes was inserted, and the pins raised up in their housing so as to remove them from the holes in the bolt and permit the sliding movement of the latter. Such a pin lock was common with many nations of antiquity, as were also locks which employed a curious hooked-shaped key, and they are described or illustrated in various ancient records.



SECTIONS SHOWING THE PRINCIPLE OF THE EARLY EGYPTIAN LOCK.

Early Greek and Roman doors were held together by devices partaking of the nature of simple fastenings rather than locks, but at a later period these mechanical contrivances had become essentially locks with keys. Sometimes these keys were supplied with wards, but no Roman or other earlier lock appropriate for such keys ever has been brought to light. In Great Britain old keys have been found, indicating locks of more or less elaboration, but none of the locks until the Middle Ages has survived.

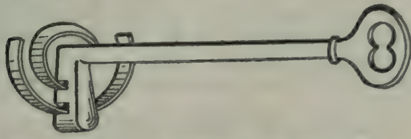


(1) EARLY EGYPTIAN AND (2) POMPEIAN KEYS.

At a period that cannot be accurately determined, there was devised or, at any rate, constructed on a practical basis, the warded lock, where a fixed obstacle was introduced in the case to stop and prevent the movement of a key, unless the latter was correspondingly cut away.

Almost contemporaneous with the early warded lock was the so-called puzzle or letter lock, often employed in the form of a large lock without a key, where various arrangements of dials were made so that once closed the same arrangement of its elements had to be observed to open it. This principle was not peculiar to any one nation or continent, as puzzle locks are to be found not only in Europe but among Russians, Chinese, and Hindus.

Warded Locks. The use of wards was devised in order to prevent any key of the same size opening a lock and to render difficult the use of false keys. In warded locks a special shape of keyhole was employed, and ridges of iron were placed in circles or parts of circles in the casing, so that the only key that could be turned in the lock, once it had entered the case, would be one having proper grooves or clefts cut in the end of the bit or projection at the extremity, so as to pass over or by these ridges. The origin of the use of wards goes far back in the art of lock making, and mediæval locksmiths evolved complicated structures which, however, could not resist master keys, picks, or skeleton keys in the hands of a skillful workman, especially where an impression was made on wax or tallow on the bit, or lock end, of the key, as in this way the presence and nature of the wards could be indicated, and keys that would fit readily could be made.



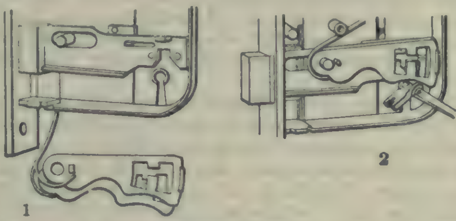
EARLY FORM OF WARDS FROM WARD LOCK.

In the exquisite work of mediæval locksmiths many keys were made where the perforations had no relation to the working of the lock, and with the latter were often combined secret escutcheons and more or less complex and artistic devices. Although increasing the number of wards rendered picking more difficult, and multiple locks were placed on the old strong boxes, making them truly complex, yet indeed they were most simple to open from the standpoint of the modern lock expert.

Up to the end of the eighteenth century, however, warded locks were considered safe, and for ordinary uses they were the only type generally employed up to the beginning of the nineteenth century, even for important purposes, and they still are in use in the cheapest form of locks, as found in ordinary furniture.

In any warded lock the essential element is a bolt made with a notch or hollow, known as a talon with which the key engages, with a back spring attached to hold the bolt in the place to which it is moved by the key. A back spring is found in most warded locks, so that the feeling to the manipulator is much the same as in a lever lock, but it gives little increase in security. The bolt is moved forward or backward by the revolution of the key, turning on a pivot if a barrel key, or with the end of it resting and revolving in a hole if of solid design. The action of the key is regulated by the length of the bit or projection at its extremity which engages the bolt, and the depth of the notch cut in the lower side of the bolt. As the wards permit only a key with corresponding openings to revolve, it is only by such a key that the bolt may be moved, and no other key of the same size will avail. The bolt has at the end opposite to that which enters the staple or face plate a small slit open to form a spring, and below are two notches divided by the grooved curve in the bolt. When the key enters and is turned around, it draws the bolt forward or backward in locking or unlocking, and the spring causes the bolt to drop into one of the notches or rise up along the groove according to the distance by which it is moved.

Tumbler or Lever Locks. The tumbler or lever lock was an advance upon the warded lock just described, as in this form one or more metal pieces, known as tumblers, levers, or latches, intercept the bolt and prevent it from being shot until they are raised or released by the action of an appropriate key. In its simplest form the tumbler or lever lock consists of the bolt, and one or more levers or tumblers which are pivoted so that they may be raised to a height depending on the clefts in the bit of the key, the end portion of which serves to move the bolt as in the warded locks. In any tumbler or lever lock the appropriate part of the bit of the key therefore must reach and raise each tumbler or lever as well as move the bolt, so that there are two elements to enforce safety, disregarding a combination with wards which is always possible. There are two typical forms of tumbler or lever locks—one where a post or stump on the bolt moves through a gating or passage between two notches in the lever, as in the illustration, and the other where the post is on the tumbler and must be raised from one to the other of two notches on the bolt. The form with the gating in the lever is now more usual and is found on many ordinary door locks, so that a description will serve to illustrate the principle of locks of this class as well as simpler locks found in ordinary uses.

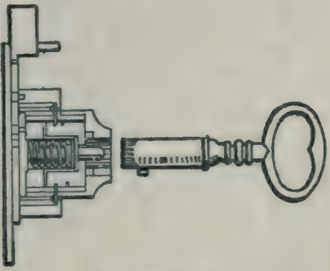


TUMBLER LOCK.

1, bolt in place, tumbler removed, and shown below; 2, tumbler in place with key being turned to lift it.

The bolt which secures the door has on its underside the talon or notch with which the key engages, while it also carries a post which, when the lever or levers are raised, can pass through the opening or gating between the two notches of the lever, which are exactly as far apart as the distance moved by the bolt. The lever or levers, which vary from one to five or six in number and are behind the bolt, are a series of small plates mounted on a pivot and usually fitted with a spring so arranged to move with regard to the post on the bolt that the latter cannot be moved until the tumblers are lifted enough to cause a clear passage through of the gating for the post as it is moved from one notch to the other. The levers are cut of different height, so that the key, by means of its various clefts, must lift all the gatings to the same height and furnish a clear path for the post. The particular cleft or notch of the key on which each lever rests accordingly raises its appropriate lever, so that when a number of levers are used the gatings of all will coincide. It is obvious that, by increasing the number of tumblers or levers as well as employing variations of the arrangement of a given set, the lock can be complicated to an almost endless extent and the security correspondingly increased.

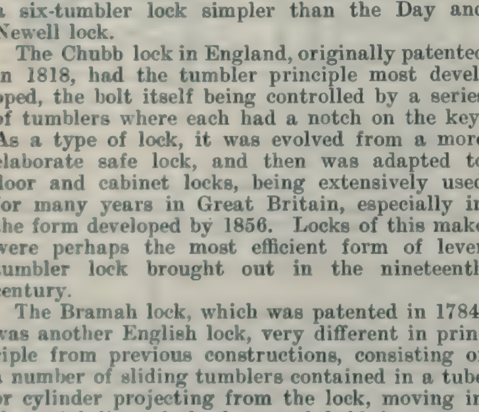
This type was considerably improved during the first half of the nineteenth century, and naturally these locks were elaborated and made with care and skill for various purposes, such as for bank vaults and fireproof safes, and with exquisite workmanship there were combined ingenious modifications, though the results in the way of new principles have survived in modern practice in but few instances. Among the devices employed at this time were detector locks, where once a key was inserted in a lock it was retained, or some device indicated that the lock had been tampered with. In the United States Andrews made a lock with a series of tumblers and a detector and also a disk or snail-wheel lock, while Newell of Day and Newell made a lock with a double set of tumblers, one to receive motion from the other. Hobbs introduced a six-tumbler lock simpler than the Day and Newell lock.



BRAMAH LOCK.

The Chubb lock in England, originally patented in 1818, had the tumbler principle most developed, the bolt itself being controlled by a series of tumblers where each had a notch on the key. As a type of lock, it was evolved from a more elaborate safe lock, and then was adapted to door and cabinet locks, being extensively used for many years in Great Britain, especially in the form developed by 1856. Locks of this make were perhaps the most efficient form of lever tumbler lock brought out in the nineteenth century.

The Bramah lock, which was patented in 1784, was another English lock, very different in principle from previous constructions, consisting of a number of sliding tumblers contained in a tube or cylinder projecting from the lock, moving in the axial line of the key, and held in contact with the latter by the pressure of a spiral spring. For ordinary purposes this lock was very secure, and as it was developed and improved it marked a more scientific advance in the art of lock making than any other lock made up to its time. Simpler methods and less expensive methods of manufacture were found to serve equally well, and for this reason the Bramah lock did not gain a permanent place.



YALE PIN-TUMBLER LOCK.

1, without key; 2, key inserted, pins brought into line, and bolt being turned.

In the United States numerous inventions were made, among which was the Parautoptic lock of Day and Newell. It was an ingenious and complicated piece of mechanism, which was widely used for some time after its introduction and up to 1850 considered absolutely safe. All of these types of locks could be picked in one way or another, and it was soon realized, as has since proved true, that any lock with an open keyhole, no matter what its interior construction, could be opened, given a workman of requisite skill, the necessary tools, and the available time.

Pin-Tumbler or Cylinder Locks. As an improvement on the lever or tumbler lock, came the pin-tumbler or cylinder lock, first brought out about 1860. It was invented by Linus Yale, Jr. (q.v.), and United States patents covering the invention were issued on Jan. 29, 1861, and June 27, 1865. It was essentially a development of the old Egyptian pin lock and was the first to employ a small flat key in place of the heavier and massive keys previously used. Soon, however, the flat key was found to be available for lever locks also, so that eventually many locks employing such a key came into use, some of which were frequently, but erroneously, referred to as Yale locks, a name which only properly applies to a lock made by the Yale and Towne Manufacturing Company.

The pin-tumbler lock consists essentially of a cylindrical shell or case containing a barrel or plug placed eccentrically, which being rotated acts to move the bolt of the lock through the agency of a cam at its inner or rear end. Unless the appropriate key is inserted in a slot or keyway extending longitudinally through the plug, the latter is prevented from being turned by five divided pin tumblers which are free to move up and down in little round holes or cylindrical chambers extending through both the lower part of the case or cylinder and down into the plug, as shown in the illustration. The upper parts of these pin tumblers or drivers are forced by springs down on the lower and corresponding parts or tumblers proper in each set of holes, when both sets of holes are in line, so that when the key is not inserted in its slot in the lock, the case and plug are held fast together and the latter prevented from being revolved with respect to the inclosing cylinder. Now, when the proper key is inserted, the lower pins, which normally rest at the lower part of the respective pin chambers and intersect the keyway, though not extending to its bottom, are forced up in their chambers, and where they are of such height with respect to the notches of the key that, when resting on the appropriate notches, their upper extremities terminate at the joint between the plug and the cylinder, the former can be rotated. As the lower extremities of the drivers must also terminate at this surface, the plug is free to rotate, since none of the pins then engage both it and the casing. Of course the revolution of the plug through the cam at its rear acts to slide the bolt, and this can occur only when the proper key is inserted, because otherwise some of the pins would be raised too high and others too low, so that the plug would still be locked, either by the upper pins falling below the boundary surface or the lower pins rising above it, and would not revolve. A variation of as much as $\frac{1}{50}$ of an inch from the true height or position in any one of the five pin tumblers usually found in a cylinder lock is sufficient to prevent the rotation of the plug in the cylinder.

The thin flat key first introduced by Linus Yale, Jr., was soon extensively applied to other types of locks, and later other forms of keys and of keyways in the plug of the pin-tumbler lock were developed, especially those known as the corrugated, the ribbed, and the paracentric. While the pin-tumbler construction offered great security by reason of the great number of permutations it permitted, neither it nor even its improved forms were absolutely secure against picking at the hands of an expert with proper tools. Greatly increased safety was secured by forming the sides of the keyway in the plug with opposing corrugations, interlocking with those of the key, thus rendering picking much more difficult, in addition to putting on the market an entirely new series of locks and keys. This device also prevented the tilting of the key in the plug and rendered its manipulation more convenient.

In the corrugated form the corrugations did not extend beyond the axial line of the keyway, so that picking the lock, while difficult, yet was possible. Accordingly this key in turn gave place to the paracentric key, where the keyway was constructed with continuous longitudinal barriers in planes parallel to the motion of the key, projecting from opposite sides of the keyway past its centre or axial line, which made an interlocking so intricate as practically to preclude the use of picking instruments to operate vertically on the tumblers. Such a key can be constructed only with special reference to the class of lock it is designed for. This type of lock represents the greatest security achieved in any form of lock having a keyhole, and has found application in locks for all purposes.

Master-Keyed Locks. Such locks are an important consideration in hotels, in office buildings, in locker rooms, and even in private houses, as it is possible to arrange a system of keys whereby a master key will control all the locks of the house with the appropriate subpass keys of more limited action down to the single keys for an individual lock. In modern lock construction different sizes and styles of locks can be brought under the control of a single master key. One arrangement of masterkeyed lock is to have two settings or changes, one uniform and the other different. A pin-tumbler lock may be master-keyed by cutting each pin in two places or by providing a second annular plug, while a duplex lock may have two sets of pin chambers, either one of which will operate the bolt.

Dial or Combination Locks. A dial or combination lock, as used on American fireproof and burglar-proof safes, is one which requires no key and consists of a bolting mechanism employed to check the heavy bolt work of a safe door, thus making it impossible to move the bolts except when duly released by the appropriate combination. In this type there is a set of changeable tumblers or wheels actuated by a spindle, passing through the door of the safe, and having a graduated dial on its outer end. By means of this the spindle can be rotated so that the tumblers can be set and the bolting mechanism released to act. Dial locks are made in two essential grades, the first for burglar-proof safes, in which the construction is heavy, elaborate, and designed to resist violence, such as the action of high explosives, while locks of the second grade, which are smaller, are intended merely for fireproof doors and are not designed to resist great violence. The dial locks used on bank vaults and burglar-proof safes may be capable of as many as 100,000,000 changes of combination. They are practically unpickable.

Dial locks of small size, commonly called "keyless" locks, are found useful in various places to obviate the use of a key, as in gymnasium and armory lockers, bathhouses, and for similar purposes where such locks are convenient, because obviating the necessity of the person exercising or bathing being troubled with a key.

Time Locks. The combination lock in its application to safes and vaults did not remove the danger of the human element, for a person acquainted with the combination and having access to the vault at unauthorized hours might open its doors or could be compelled by threats or force to reveal the combination to a burglar. Accordingly the time lock was added to the combination lock for the protection of bank and safe-deposit vaults. Clockwork in connection with a lock had been patented in Great Britain in 1831 by Rutherford, and in 1836 an alarm lock was patented by Meighan; but the use of clock mechanism to release the levers did not find practical use until about 1875, and even to-day such use is confined almost exclusively to the United States and Canada, although a few American time locks are found in the various foreign countries, especially in England.

In the time lock the locking mechanism acts by clockwork, which usually is in the form of two or more chronometer movements of the finest construction, three or four being employed in the largest and most elaborate constructions. These movements are in multiple, so that the failure of one will not prevent the unlocking of the safe door during predetermined hours for which the clockwork is set, with a special attachment for Sundays and holidays. The time lock serves merely to release the bolt-operating mechanism, which usually is quite heavy and is also guarded by one or more combination locks. The bolt work may be operated by hand through the agency of a spindle or by an automatic bolt motor. This last device, used in connection with a time lock, is a mechanism attached to the inside of a safe door and containing heavy springs, which are set or compressed while the door is open, and which when released by the action of the time lock are capable of automatically retracting the heavy bolt work of the door, whose outer surface is absolutely unbroken and therefore as strong as any other part of the safe, and there is no communication between the interior and exterior. A further protection sometimes employed consists in an electromagnetic device which guards the automatic mechanism until released by closing the proper circuits at a keyboard.

The importance of the lock on a safe-deposit or bank-vault door can be estimated by considering it in connection with such a door as that of the vault of the J. P. Morgan & Co. building built in 1914 in New York City. This door is 9 feet in diameter, with a thickness of 45½ inches, in the form of massive armor plate, and weighing with its vestibule 120 tons. The door is held by a series of 5-inch bolts, which are controlled by two combination locks, and these in turn by time locks with four clock movements, any one of which will permit the opening of the combination locks and thus release the door.

Safe-Deposit Locks. Within the safe-deposit vault itself the individual safes and boxes of the customers require a special form of lock in order to secure the greatest safety. The usual type is a key lock provided with a guard lock, the key of the latter being kept by the custodian of the vault and common to all of the safes in the vault. Each lock has an individual or change key unlike any other in the vault, but which will not open its lock until the guard key has been inserted and turned, thus making the presence of the custodian absolutely essential to the opening of a box. Various types of improved lever-tumbler or pin-tumbler mechanisms are provided for these boxes, and if the box is very large a dial lock may be used. See SAFES AND SAFE-DEPOSIT VAULTS.

Keys. In olden times keys were ponderous affairs, which were borne on the shoulder instead of being tucked away in the pocket. The modern key, which has been developed to a point where it is as small as possible for its function and for necessary strength, consists of three parts—the bow, or upper end; the bit, or lock end; and the connecting shank. When the cuts or notches of the bit are on the side or edge, they indicate a tumbler or lever lock; when the cuts are on the top or bottom, the key belongs to a warded lock. When the shank is tubular, or, in other words, belongs to a barrel key, it indicates a lock which can be operated from one side only, such as are used for cupboards, drawers, and chests, while door-lock keys have solid shanks and will operate the lock from either side, this form being usually known as round keys. Such keys may be made of cast iron, of malleable iron, or of bronze or brass, and also may be built up of several pieces. A solid steel key, however, is the best of this class.

Cylinder locks at first had flat keys. This form of key, with or without a wing or bit, was soon found available for lever-tumbler and warded locks. Subsequently to render more difficult the introduction of picks into the pin-tumbler lock, the key and its plug, as we have seen, were corrugated, and finally modern Yale locks, i.e., those made by the Yale and Towne Manufacturing Company, have what is known as a "paracentric" instead of a flat key.

Classification of Locks. Locks in a general way may be classified according to the uses for which they are intended. Those used in the construction of buildings are classified as *Builders' Locks* and include numerous types, in many of which with the dead-bolt or night-latch mechanism there is combined a latch bolt operated by an ordinary door knob. Mortise locks are those intended to be mortised into the door, while rim locks are designed for attachment to its surface.

Cabinet Locks.—Cabinet locks, such as are found in furniture and cabinetwork generally, differ from builders' locks and often constitute a separate industry, affording scope for interesting artistic designs for their escutcheons, plates, and knobs, rather than complex mechanical construction. Under this head may be classed drawer or till locks, wardrobe locks, chest and box locks, desk locks, and literally hundreds of types designed for specific purposes. Just as for doors, so for cabinetwork the pin-tumbler type is the best, and various forms of keys may be used.

Other classes of locks, whose uses are explained by their titles and which show in each class many types, are trunk locks, prison locks, asylum locks, and padlocks. These are described in the catalogues of the leading manufacturers.

Lock Controversies. In 1851, at the time of the World's Fair in London, there began in England a so-called "lock controversy," which at the time and for some years afterward attracted great interest and attention and occupies a prominent place in the various histories of the lock industry. (See BIBLIOGRAPHY.) A firm of British locksmiths, the Messrs. Bramah, making locks of recognized security, offered a reward to any expert locksmith who could succeed in picking one of their best bank locks. An American named A. C. Hobbs was successful in picking this lock in the presence of an authorized committee, and made for himself a reputation which resulted in his name and genius being availed of by a British firm of manufacturers under the style of Hobbs, Hart & Co., who put the Hobbs lock on the market and have since continued the manufacture of a standard lever-tumbler type of locks of excellent workmanship. As an additional element in this lock controversy, Linus Yale, Jr., discovered how to pick the then celebrated Day and Newell Parautoptic Bank Lock, which was of American origin, but was then known in England as the Hobbs lock. Yale also discovered that he could pick the best bank lock, the "double treasury," which he had himself designed, and finally demonstrated that any lock having a keyhole could be opened by an expert with the necessary skill and time at his disposal. Accordingly Mr. Yale proceeded to develop the combination or dial lock, which in crude forms, as we have already seen, was known for centuries, so that before he died it had displaced nearly all other locks for the protection of bank vaults. The keyhole was done away with, and the external dial took its place. The general use of this lock led to a similar controversy in the United States about 1870, and the Yale bank lock was picked by James Sargent of the firm of Sargent and Greenleaf, of Rochester, New York, a lock inventor and a leading maker of bank locks; but the Sargent lock in turn was picked by an expert of the Yale and Towne Manufacturing Company. This led to improvements which overcame the defects in both locks, and principles were devised and adopted for combination locks such that to-day these locks, even in their cheaper forms, are considered absolutely unpickable by any known process.

Lock Industry. The early lock industry in America followed mainly European and especially British models. The chief point of difference established was the extensive use of cast iron for locks and lock cases, as against wrought iron in Europe. In the first half of the nineteenth century cast iron became highly developed in the United States and found many applications, so that it was but natural that it should enter into hardware and particularly into locks. With improved processes for working sheet metal, especially steel, there was developed in the United States, towards the end of the nineteenth century, a type of lock made of cold rolled and pressed steel, which, made by automatic machinery where the individual parts were punched, stamped, or drop-forged, and developed to a high point of workmanship, soon acquired reputation and a field of usefulness. Constructed by modern processes, where hand labor was superseded by dies and drop forgings, these locks could be made so as to be generally available on the score of expense. Constant improvements in locks as well as in methods of manufacture have been a feature of the industry rather than the evolution of new principles. In the United States the lock industry is centred chiefly in Connecticut, but there are also manufacturers in eastern Pennsylvania and Illinois.

Bibliography. For the development of early locks, consult John Chubb, "On the Construction of Locks and Keys," in *Proceedings of the Institution of Civil Engineers* (London, 1850); also a paper by Harry W. Chubb, entitled "Locks and Safes," in the *Journal of the Society of Arts* (ib., 1893). Consult also: Charles Tomlinson, *Rudimentary Treatise on the Construction of Locks* (ib., 1853); Geo. Price, *Treatise on Locks* (ib., 1856, out of print); chapter on "Locks," in Clarence Blackall, *Builders' Hardware* (New York, 1899); chapter on "Locks," in Kidder, *Building Construction and Superintendence* (3d ed., New York, 1913); H. R. Towne, *Locks and Builders' Hardware* (New York, 1904); and catalogues of leading manufacturers which contain much descriptive material. See SAFES AND SAFE DEPOSIT VAULTS.

LOCK, IN ENGINEERING. See CANAL; DAMS AND RESERVOIRS; FOUNDATION.

LOCK, or **LOCKE,** MATTHEW (c.1630–77). An English composer. He was born in Exeter and received instruction in the rudiments of music from Wake, organist of Exeter Cathedral. When Charles II made his entry into London after the Restoration, Lock was employed to write the music for the occasion and was afterward appointed composer to the King. He was the first musician of England to compose for the stage and wrote some rather famous instrumental music for *The Tempest* and *Macbeth,* as well as excellent sacred music.

LOCK, WALTER (1846–). An English theologian. He was educated at Marlborough and at Corpus Christi, Oxford, became a fellow of Magdalen College in 1869 and tutor (1870), subwarden (1880), and warden (1897) of Keble College. His connection with this college led to his publishing a biography of John Keble (1892) and annotated editions of *The Christian Year* (1895) and *Lyra Innocentium* (1899). He was general editor of the Westminster commentaries on the Revised Version and of the Oxford commentaries, and author of *St. Paul the Master Builder* (1899) and *The Bible and Christian Life* (1905).

LOCKE, DAVID ROSS (1833–88). An American humorist, born in New York, known by his assumed name of Petroleum V. Nasby. Locke first attracted attention by letters published in the Findlay *Jeffersonian* in 1860 with the signature Rev. Petroleum Vesuvius Nasby. They purported to emanate from a poor and ignorant Democrat with a yearning for the postmastership and whisky and an admiration for the institution of slavery. The character was dramatically developed in a series of amusing incidents. The letters were soon transferred to the Toledo *Blade,* of which Locke became editor and in part proprietor. They were of great assistance to the war administration of Lincoln by meeting the criticism of the Peace Democrats of the North. Later, their sting was directed against President Johnson and his "swinging 'round the circle." Locke became a popular lecturer and in 1871 moved to New York and finally returned to Toledo. He published in book form: *Divers Views, Opinions, and Prophecies of Yours Truly* (1865); *Swingin' 'round the Cirkle* (1866); *Ekkoes from Kentucky* (1867); *The Struggles—Social, Financial, and Political—of P. V. Nasby* (1872), in which the best of his humorous work was gathered; *A Paper City* (1878), a novel; *Nasby in Exile* (1882).

LOCKE, JOHN (1632–1704). An English philosopher, born at Wrington, near Bristol, on Aug. 29, 1632. His father was an attorney and also served as captain in the Parliamentary army during the Civil War. Locke was sent for his education to Westminster School, where he continued till 1652, when he became a student of Christ Church, Oxford. After his graduation he took pupils, and from 1661 to 1664 he lectured in Oxford on Greek, rhetoric, and moral philosophy. In 1665 he went to Cleves as secretary to the British Envoy, but soon returned to his studies at Oxford, where he devoted himself to medicine for a while. In 1666 he made the acquaintance of Lord Ashley, afterward Earl of Shaftesbury, and on his invitation went to live at his London house and became his family physician. It was in Lord Ashley's house that he had his attention directed to the importance of undertaking an investigation of the limits of human understanding. This investigation resulted many years after in the publication of his famous *Essay.* In 1672, when Shaftesbury became Lord Chancellor, Locke was appointed Secretary of Presentations, a post which he afterward exchanged for that of Secretary to the Council of Trade. He was employed to draw up a constitution for the American Province of Carolina, but the constitution was never adopted. After Shaftesbury's fall in 1675 Locke took up his residence at Montpellier for the benefit of his health. Here he formed the acquaintance of the Earl of Pembroke, to whom his *Essay* is dedicated. In 1679 he rejoined the Earl of Shaftesbury in England; but in 1682 the Earl fled to Holland, to avoid a prosecution for high treason. Although there is no evidence to warrant the belief that Locke was implicated in any treasonable practice, he was under surveillance and in the following year followed the Earl to Holland and so far shared with him the hostility of the government of Charles as to have his name erased, by royal mandate, from the list of students of Christ Church. Even in Holland he was demanded of the States-General by the English Envoy; but he contrived to conceal himself under the assumed name of Dr. Van der Linden, till the English court ceased to trouble itself on his account. In 1687 his *Essay Concerning Humane Understanding,* begun 17 years before, was finished; and an abridgment of it was published in French (1688) by his friend Le Clerc, in his *Bibliothèque Universelle,* in which Locke had published two years before his *New Method of Making Commonplace Books.* In 1689 he came back to England in the fleet that conveyed the Princess of Orange. He soon obtained from the new government the situation of Commissioner of Appeals, worth £200 a year. He took a lively interest in the cause of toleration and in maintaining the principles of the Revolution. In 1689 there appeared anonymously his first letter on "Toleration," the second letter in 1690, the third in 1692, and the fourth in 1706 (after his death). In 1690 his *Essay Concerning Humane Understanding* was published and met with a rapid and extensive celebrity, although Locke himself received only £30 for the copyright of the first edition. In the same year there appeared his well-known *Treatises on Government*. In 1691 he was engaged upon the momentous question of the restoration of the coinage and published a tract on the subject, followed by other financial papers in 1695. In 1693 was published *Some Thoughts of Education*. In 1696 King William appointed him member of a new council of trade at a salary of £1000. *The Reasonableness of Christianity*, anonymously published in 1695, had been written to promote William's favorite scheme of a comprehension of all the Christian sects in one national Church. In this work he argued the necessity of identifying Christianity, not with a belief in mysteries such as the incarnation and the atonement, but with the gospel of love. He maintained a controversy in defense of this book; he had another controversy in defense of the *Essay*, against Stillingfleet, Bishop of Worcester. His feeble health compelled him to resign his office in June, 1700, and he spent the remainder of his life at Oates in Essex, at the seat of Sir Francis Masham, who had taken Locke into his home in 1691. His last years were very much occupied with the study of the Scriptures, on which he wrote several dissertations, which, with his little work entitled *On the Conduct of the Understanding*, were published after his death. He died Oct. 28, 1704, leaving quite a number of unpublished writings.

Great as were Locke's services to his country and to the cause of civil and religious liberty, his fame rests on the *Essay Concerning Humane Understanding*, which marks an epoch in the history of philosophy. His purpose was to inquire into the powers of the human understanding, with a view to finding out what things it was fitted to grapple with, and where it must fail, so as to make the mind of man "more cautious in meddling with things exceeding its comprehension, and disposed to stop when it is at the utmost extent of its tether." He institutes a preliminary inquiry in the first book as to the existence of innate ideas, theoretical and practical, on which the philosophical world has been much divided. (See COMMON SENSE, PHILOSOPHY OF.) Locke urges against the existence of these supposed innate conceptions or intuitions of the mind the fact that there is no truth universally accepted by mankind. Having thus repudiated the intuitive sources of our knowledge or ideas, he is bound to show how we come by them in the course of our experience. Our experience being twofold, external and internal, we have two classes of ideas—those of sensation and those of reflection. He has therefore to trace the recognized conceptions of the mind to one or other of these sources. Many of our notions are obviously derived from experience, as colors, sounds, etc.; but some have been disputed, more especially ideas of space, time, infinity, power, substance, cause, moral good and evil; and Locke discusses these at length, by way of tracing them to the same origin. This is the subject of book ii, entitled "Of Ideas." Book iii is on language considered as an instrument of truth and contains much valuable material. Book iv is on the nature, limits, and reality of our knowledge, including the nature of demonstrative truth, the existence of God, the provinces of faith and reason, and the nature of error. This work was epoch-making in the history of British philosophy, giving rise to English Empiricism (q.v.), and calling forth as reply Leibnitz's *Nouveaux essais sur l'entendement humain*, in which he canvasses Locke's work chapter by chapter.

In his views on government Locke was a disciple of Hobbes, but he was not slavish in his discipleship. He believed with Hobbes that government is the result of an original contract, but the state of nature preceding the establishment of government he did not believe to be a state of war. Right existed before the foundation of society. Society is a means to the better enjoyment of natural rights. Locke distinguishes in government the three functions of legislation, execution, and adjudication. Of these the legislative function is supreme, but even over this stands the sovereign will of the people. When the people enforce their will against the government, there is no rebellion. They are acting within their rights. In ethics he was a hedonist. Good and bad are equivalent to pleasure and pain or their causes. Moral good is accordance with the law imposed by an authority which rewards us with pleasure for obedience and punishes us with pain for disobedience. The law-imposing authority may be divine or human.

Bibliography. Locke's collected works have been published from 1714 on. A convenient edition of his philosophical works is St. John's (London, 1854), followed by many subsequent issues. The best edition of the *Essay* is A. C. Fraser's (2 vols., Oxford, 1894), with notes; Miss Calkins published a volume of *Selections from the Essay* (Chicago, 1905). For biography, see King, *The Life of John Locke* (London, 1829); Forster, *Original Letters of Locke* (ib., 1830); H. R. Fox-Bourne, *The Life of John Locke* (2 vols., ib., 1876); T. Fowler, *John Locke* (ib., 1880); A. C. Fraser, *Locke* (Edinburgh, 1890)—the last two works give also popular accounts of his philosophy; Charles Bastide, *John Locke: Ses théories politiques et leur influence en Angleterre* (Paris, 1907); H. Ollicon, *La philosophie générale de John Locke* (ib., 1909); Ernst Crous, *Die religionsphilosophische Lehren Lockes und ihre Stellung zu dem Deismus seiner Zeit* (Halle, 1909); and standard histories of modern philosophy. For a fuller bibliography, see Ueberweg-Heinze, *Grundriss der Geschichte der Philosophie* (8th ed., Berlin, 1896). A convenient compendium of Locke's philosophical views may be found in G. E. Russell, *The Philosophy of Locke* (New York, 1891).

LOCKE, JOHN (1792–1852). An American physicist and inventor, born at Freiburg, Me. He was educated at Bethel Academy and at Yale, graduating in 1819, and then entered the navy as a surgeon. Later he settled in the Middle West and became well known as a geologist, botanist, and inventor of scientific instruments. For many years after 1836 he was professor of chemistry in the Medical College of Ohio. He published, among other papers, *Observations on the Terrestrial Magnetism of Several Parts of the United States* (1846).

LOCKE, M. See LOCK, M.

LOCKE, WILLIAM JOHN (1863–). An English novelist, born in Barbados and educated at the Queen's Royal College, Trinidad, and at

St. John's, Cambridge, where he graduated in 1884. By profession an architect, he was secretary from 1897 to 1907 of the Royal Institute of British Architects. He devoted himself also to novel writing, but made no great mark with either critics or the larger public until his *The Morals of Marcus Ordeyne* appeared, in 1905, to be followed by his best book, *The Belovéd Vagabond*, a year later. The first-named story was dramatized and presented (1906) as a play with great success in England and in America. *The Belovéd Vagabond* was also successfully presented (1908) as a play. These two novels are fairly representative of Locke. In them one meets the whimsical, quixotic, eccentric, irresponsible Bohemians for whom he manifests a special affection; and they are characterized by the tolerant humor, the irony, the tenderness, and the chivalrous spirit that belong to this author's personality. The Bohemianism of his novels would perhaps have been something other than it is, had not Murger preceded him with the *Vie de Bohème*, and what his work would have been without the influence of Anatole France, which has left its marks everywhere in it, it is difficult to imagine. To be sure, France's deadly home thrusts and the reckless and fearsome audacities of his irony are not attained, nor indeed attempted, by Locke's amiable, and perhaps a trifle sentimental, talent. Among this author's novels, in addition to the two named above, are: *At the Gate of Samaria* (1895); *Derelicts* (1897); *Idols* (1898); *Where Love Is* (1903); *Septimus* (1909); *Simon the Jester* (1910); *The Glory of Clementina Wing* (1911); *The Joyous Adventures of Aristide Pujol* (1912); *Stella Maris* (1913); *The Fortunate Youth* (1914). Locke's plays, besides those already mentioned, include: *The Palace of Puck* (1907); *Butterflies* (1908); *The Man from the Sea* (1910); *An Adventure of Aristide Pujol* (1912); *Jaffery* (1915).

LOCK'ER-LAMP'SON, FREDERICK (1821–95). An English writer, born May 29, 1821, in Greenwich Hospital, of which institution his father was civil commissioner. For many years he was a précis writer in the Admiralty, Whitehall, but after middle life he devoted himself to travel, society, and literature, and became well known in 1857 by a collection of graceful society verse, entitled *London Lyrics*. He subsequently published an anthology, *Lyra Elegantiarum* (1867; new ed., 1891), and a volume of miscellanies, *Patchwork* (1879), which, made up as it was of selections from various writers, in his opinion brought together "some of the best specimens of *vers de société* and *vers d'occasion* in the English language." Locker married in 1850 Lady Charlotte Bruce, a daughter to Lord Elgin, and after her death the only daughter of Sir Curtis Lampson (1874), from whom he took the name Lampson. He died at Rowfant, May 30, 1895. Ill health precluded his taking any vigorous share in stirring events. He is, however, unexcelled in English as a writer of light verse that is always neat and witty, and never descends to farce or cynicism. Remarkably gifted socially, his wide circle of friends included many of the most distinguished of English men of affairs and men of letters. As a connoisseur, he made collections in various fields, but most important was his large and valuable library, catalogued in the bibliographically useful *Rowfant Library* (1886; with appendix, 1900). His posthumous memoirs, *My Confidences* (1896; ed. by his son-in-law, Augustine Birrell), acquaints the reader with an attractive personality and gives none too high an estimate of his poetry.

LOCKHART, lŏk'härt. A town and the county seat of Caldwell Co., Tex., 30 miles (direct) south of Austin, on the San Antonio and Aransas Pass, and the Missouri, Kansas, and Texas railroads (Map: Texas, D 5). It ships large quantities of planting cottonseed and controls also the trade of a cotton, grain, and livestock region, and has cotton gins and a compress, a cottonseed-oil mill, lumber yards, wagon works, a soap factory, etc. Pop., 1900, 2306; 1910, 2945.

LOCKHART, GEORGE (1673–1731). A Scottish Jacobite. He was a member of Parliament from 1702 to 1715, and in 1706 he was one of the commissioners for the union with England. For plotting with the Jacobites he was twice imprisoned in Edinburgh Castle; and after his second release he was confidential agent of James Stuart from 1718 to 1727, when the discovery of correspondence forced him to go into hiding and subsequently to flee the country. The Duke of Argyll obtained permission for his return in 1728, and thereafter he lived in retirement until he was killed in a duel. His *Memoirs Concerning the Affairs of Scotland* (1714; 3d ed., 1714), together with certain correspondence and papers, were published as *The Lockhart Papers* (2 vols., 1817), a valuable source for Jacobite history.

LOCKHART, JOHN GIBSON (1794–1854). The son-in-law and biographer of Walter Scott. He was the son of Rev. John Lockhart and was born in the manse of Cambusnethan, Scotland, July 14, 1794. Two years later his father became minister of the College Kirk in Glasgow. From the high school and the University of Glasgow young Lockhart proceeded to Balliol College, Oxford, where he graduated in 1813. He afterward studied law at Edinburgh and became an advocate at the Scottish bar (1816). Already interested in literature, he made a German tour in 1817, visiting Goethe at Weimar. In April of the same year *Blackwood's Magazine* was founded, and Lockhart soon became one of its chief contributors. In the October number he assailed Coleridge and Leigh Hunt, the leader of "the Cockney school" of poets; and he had a hand in the buffoonery of "The Chaldee Manuscript." In 1822 he edited Motteux's translation of *Don Quixote*, and in 1823 appeared in book form his good translations of Spanish ballads. In 1819 he published *Peter's Letters to his Kinsfolk*, a satirical description of Edinburgh society. In 1818 he had made the acquaintance of Sir Walter Scott, whose daughter Sophia he married in 1820. Four novels now followed: *Valerius* (1821), a Roman tale, placed in the time of Trajan; *Adam Blair* (1822); *Reginald Dalton* (1823); *Matthew Wald* (1824). *Adam Blair* is a powerful story on the theme to be treated later by Hawthorne in *The Scarlet Letter*. In 1825 Lockhart became editor of the *Quarterly Review*, a position he held for a decade, and in 1843 auditor of the Duchy of Lancaster. In the interval he wrote: *Life of Burns* (1828); *History of Napoleon* (1832); and the work by which he is best known, the *Life of Scott* (1836–38). After Boswell's *Johnson*, this is the most admirable biography in the English language. Lockhart's last years were saddened by domestic troubles.

He retired from the *Quarterly* (1853), resigned the auditorship of Lancaster (1854), and died at Abbotsford, Nov. 25, 1854. Consult Leslie Stephen, in *Dictionary of National Biography*, vol. xxxiv (London, 1893); Andrew Lang, *Life and Letters of Lockhart* (2 vols., New York, 1897).

LOCK HAVEN. A city and the county seat of Clinton Co., Pa., 24 miles by rail west-southwest of Williamsport, on the west branch of the Susquehanna River, and on the Pennsylvania and the New York Central and Hudson River railroads (Map: Pennsylvania, F 4). It is the seat of the Central State Normal School and has a public library and a hospital. The city is surrounded by an agricultural and lumbering country, and its industries include several planing mills, a tannery, extensive paper mills and fire-brick works, a large silk mill, and manufactures of furniture, cigars, beer, woven wire, etc. There are municipal water works. Lock Haven was settled in 1769 and was incorporated as a town in 1833, as a borough in 1844, and as a city in 1870. It has adopted the commission form of government. Pop., 1900, 7210; 1910, 7772.

LOCKJAW. An infectious bacterial disease. See TETANUS.

LOCKLAND. A village in Hamilton Co., Ohio, 12 miles north of Cincinnati, on the Cincinnati, Hamilton, and Dayton, the Cincinnati Northern, and the Cleveland, Cincinnati, Chicago, and St. Louis railroads. There are paper mills, a cotton factory, and a roofing plant. Pop., 1900, 2695; 1910, 3439.

LOCKOUT. The withdrawal of employment from a body of men who refuse to accede to the employer's conditions. The lockout is usually distinguished from the strike on the ground that in the lockout it is the employer who directly causes the stoppage of operations, while in the strike the initiative lies with the men. The distinction is wholly superficial, since the workers, by demands that seem to the employer unreasonable, may really be responsible for the lockout, just as the employer, by the imposition of onerous conditions, may force a strike. For this reason most students of the labor problem are convinced that no purpose is served by the distinction which is usually drawn between the two phenomena.

Bibliography. United States Commissioner of Labor, *Twenty-first Annual Report* (Washington, 1900); *Report of the Industrial Commission*, vol. xvii (ib., 1901); C. D. Wright, *Battles for Labor* (Philadelphia, 1906); Harris Weinstock, *Report on the Labor Laws and Labor Conditions of Foreign Countries in Relation to Strikes and Lockouts* (Sacramento, 1910); W. A. Martin, *Treatise on the Law of Labor Unions* (Washington, 1910); Commercial, Labour, and Statistical Department of Great Britain, *Strikes and Lock-outs* (London, 1912); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. ii (New York, 1914). See STRIKES AND LOCKOUTS.

LOCK′PORT. A city in Will Co., Ill., 33 miles by rail southwest of Chicago, situated on the Des Plaines River, on the Sanitary District and the Illinois and Michigan canals, and on the Chicago and Alton and the Atchison, Topeka, and Santa Fe railroads (Map: Illinois, J 2). One of the features of the city is Dellwood Park. There are oil mills, a lock factory, a cereal factory, and stone quarries. The water works are owned by the city. Pop., 1900, 2659; 1910, 2555.

LOCKPORT. A city and the county seat of Niagara Co., N. Y., 26 miles by rail north by east of Buffalo, on the New York Barge Canal and on the New York Central and Hudson River, the International, and the Erie railroads (Map: New York, B 4). The canal, here crossed by the New York Central Railroad bridge, 500 feet in length and 60 feet above the water, passes over the continuation of the Niagara escarpment, 60 feet in height at this point, by means of a tier of two locks, with a combined lift of 49 feet. These are operated by electricity and have replaced an old hand-operated system of five locks. The city has abundant electric power, extensive quarries of limestone and sandstone, a large trade in grain and fruit, and manufactories of milling and woodworking machinery, indurated fibre, pulp and paper, aluminium, glass, flour, brooms, cotton batting, wall board, carriages, rolling-mill products, textiles, crucible steel, etc. The important buildings include the Odd Fellows Home, county jail and almshouse, Federal building, and the courthouse. The government is administered, under a charter revised in 1900, by a mayor, elected every two years, who controls appointments to the boards of health, fire, police, water, assessors, and plumbing, and by a unicameral council, composed of the executive and 10 aldermen, four of the aldermen being elected at large. Administrative officials other than those mentioned are chosen by popular election. The city owns and operates the water works. Pop., 1900, 16,581; 1910, 17,970; 1914 (U. S. est.), 19,581; 1920, 21,308. A settlement sprang up here when the Erie Canal was opened (1825). The village was incorporated in 1829 and the city in 1865. Consult Pool, *Landmarks of Niagara County* (Syracuse, 1897).

LOCKROY, lŏ'krwä' (properly SIMON), EDOUARD ETIENNE ANTOINE (1838–1913). A French journalist and politician. He was the son of the dramatist Joseph Philippe Simon Lockroy (1803–91) and was born in Paris. In 1860 he went to Italy and fought under Garibaldi in the Sicilian campaign. Soon afterward he accompanied Renan as secretary on his travels through Palestine (1860–64). Upon his return to Paris he began his journalistic career and contributed to the *Figaro* and the *Diable à Quatre*. His articles in *Le Rappel* resulted in his being imprisoned for four months (1869). He commanded a battalion during the siege of Paris and was a member of the National Assembly in 1871. During the troubles of the Commune he was arrested and was again imprisoned for a few months. A year later, when editor of *Le Peuple Souvrain*, he was imprisoned for his duel with Paul de Cassagnac, and again for an article in *La Libération du Territoire* (1873). In the same year he was elected to the National Assembly as a member of the Extreme Left. He was Minister of Commerce and Industry (1886–87) and Minister of Public Instruction (1888–89), and he directed the formation of the Universal Exposition of 1889. He was thrice vice president of the Chamber (1889, 1893, and 1903) as head of the Radical party, and Minister of Marine (1895–96, 1898, 1898–99). He was elected to the National Assembly for the last time in 1907. Some of his contributions to the magazines have been gathered into the volumes: *A bas le* *progrès* (1870); *La Commune et l'Assemblée* (1871); *L'Ile révoltée* (1877); *Ahmed le boucher* (1888); *La défense navale* (1899); *Les marines française et allemande* (1904). He also edited the memoirs of his grandmother, Madame Jullien, as the *Journal d'une bourgeoise pendant la Révolution, 1791–93* (1881).

LOCKROY, Joseph Philippe Simon (1803–91). A French dramatic author, born at Turin. He received an excellent literary education, went on the stage as a youth, and was a successful actor. His first attempts in playwriting were in collaboration with Scribe, in *La marraine* (1827) and *Catherine II* (1831); his next with A. Bourgeois and Arnould, in *L'Impératrice et la juive* (1834), *La vieillesse d'un grand roi* (1837), and *La jeunesse dorée* (1849). He was credited with a considerable share in Dumas's drama *La conscience* (1855), and was joint author of *La fée Carabosse* (Lyric Theatre, 1859) and the comic operas *Ondine* (Lyric, 1863) and *Suzanne* (Opéra Comique, 1879). Many of his own pieces were performed at the Opéra Comique, such as *Le bon garçon* (1837), and at the Lyric, *Les dragons de Villars* (1856) and *La reine Topaze* (1856). He also composed genre scenes and vaudevilles.

LOCKS'LEY HALL. A poem by Tennyson (1842).

LOCK'UP'. A place of temporary detention for persons held on a criminal charge pending arraignment or trial and conviction, and for persons detained as witnesses in criminal cases. The term is English, but it is in use in some parts of the United States as the equivalent of jail or police cell. It is not generally applied to prisons or penitentiaries to which criminals are committed after conviction. See Prison.

LOCK'WOOD, Belva Ann (Bennett) (1830–1917). An American lawyer and reformer. She was born at Royalton, N. Y., graduated in 1857 at Genesee College, Lima, N. Y., and after teaching school for 11 years studied law and was admitted to the bar of the District of Columbia in 1873. In 1879 she was admitted to practice before the Supreme Court, under a law admitting women, which she had been instrumental in getting passed. She lectured frequently and became prominent in peace, woman suffrage, and temperance movements. In 1884 and in 1888 she was nominated for President by the Equal Rights party, and in 1896 represented the United States under a commission from the Secretary of State at the Congress of Charities and Corrections held at Geneva, Switzerland. She was a delegate to the Arbitration Convention, New York (1907) and to the International Peace congresses at London (1908) and at Rome (1911); and in 1913 she became a member of the International Peace Bureau at Brussels. She was married in 1848 to Uriah H. McNall, who died five years later, and in 1868 to Dr. Ezekiel Lockwood.

LOCKWOOD, Henry Hayes (1814–99). An American soldier and authority on military tactics. He was born in Kent Co., Del., graduated at West Point in 1836, served in the Seminole War as a lieutenant in the Second Artillery, and resigned his commission in the next year. In 1841 he was made professor of mathematics at the United States Naval Academy, where from 1851 to 1866 he held the professorship of field artillery and infantry tactics. He entered the Union army in the Civil War as colonel of the First Delaware Infantry, was commissioned a brigadier general of volunteers on Aug. 8, 1861, and served in the defenses of the lower Potomac. He commanded a brigade at Gettysburg and in the winter of 1863–64 was commander of the Middle Department, with headquarters at Baltimore. Later he took part in the Richmond campaign. He was the author of *Manual of Naval Batteries* (1852) and *Exercises in Small Arms and Field Artillery* (1852).

LOCKWOOD, James Booth (1852–84). An American Arctic explorer, born at Annapolis, Md., where his father, Gen. H. H. Lockwood (q.v.), was a professor in the United States Naval Academy. He was educated at Bethlehem, Pa., and at St. John's College, Annapolis, and in October, 1873, received a commission as second lieutenant in the army. For the next seven years he served in the West. In 1881 he accompanied Gen. A. W. Greely (q.v.) on his expedition to Lady Franklin Bay, serving as second in command. On April 3, 1882, he was sent to explore the coasts of northwestern Greenland. Traveling with a dog sledge he was supported as far as Cape May, Greenland, on the Polar Ocean, by seven men dragging three sleds. From that point, with Sergeant Brainard, Eskimo Christiansen, and a dog sledge, Lockwood struck across the frozen ocean for Cape Britannia, the farthest point even seen by his predecessors. Reaching Mary Murray Island, named for his sister, he carefully determined its position—83° 24′ N., 40° 46′ W. He added 125 miles of new coast, named Hazen Coast, and gained for America the record for the farthest north, held for three centuries by England. This northing, the only world's record ever verified by a successor, was within 15 miles of the most northern point of land since discovered. Lockwood's opinion that Greenland continued uninterruptedly to the point he had reached was disputed, but is now definitely confirmed. His journey of 1069 miles in 60 days was made without disaster of any kind. The open condition of the Polar Sea in 1883 prevented his surpassing his northing of 1882. With Brainard in 1883 Lockwood reached the Western Polar Ocean and discovered Greely Fjord. He distinguished himself for his loyalty and courage during the winter of fearful privations at Cape Sabine, where he died April 9, 1884. Consult Lanman, *Farthest North* (New York, 1885), and the official *Reports on the Lady Franklin Bay Expedition* (Washington, 1887).

LOCKWOOD, Wilton (1861–1914). An American portrait and flower painter. He was born at Wilton, Conn., and studied under La Farge in New York and for 10 years in Paris. He met his first decided success abroad in 1904, and an exhibition of his paintings and studies in Boston in 1905 assured his reputation in America. Although his art was strongly influenced by La Farge, it is original and personal to a high degree. His portraits are distinguished by a luminous misty atmosphere, subtly harmonious color, refinement of line, and sympathetic and individual characterization. Among the best known are "John La Farge" (Boston Art Museum); "The Violinist" (Skibo Castle, Scotland), awarded the Temple gold medal at Philadelphia, 1898; "Frank Seabury"; "A. J. Cassatt"; "Mrs. Sweetser"; "Grover Cleveland"; "Jerome Wheelock" (Worcester Museum), and "Justice Holmes" (1912, Massachusetts Bar Association). As a flower painter, he is known chiefly for his peonies. Good examples of his work in this field are in the Metropolitan Museum, New York, the Boston Art Museum, and the Corcoran Gallery, Washington. He received silver medals at Paris (1900), Buffalo (1901), and St. Louis (1904), and became a National Academician in 1912.

LOCKYER, lŏk'yẽr, SIR (JOSEPH) NORMAN (1836–1920). An English astronomer and physicist, born at Rugby. He studied in England and on the Continent. In 1857 he was appointed clerk at the War Office, which position he retained for several years, devoting his leisure to the study of astronomy. In 1870 he was appointed secretary of the Duke of Devonshire's commission on scientific instruction and the advancement of science, and in 1871 assistant commissioner. In 1871 also he was Rede lecturer at Cambridge. He was transferred to the Science and Art Department at South Kensington in 1875. Between 1870 and 1905 he was leader of eight eclipse expeditions of the English government. On the foundation of the Royal College, he was appointed professor of astronomical physics and director of the Solar Physical Observatory at South Kensington. When the Observatory was removed to Cambridge in 1913 he resigned his position as director, and became director of the Hill Observatory at Salcombe Regis, near Sidmouth. Lockyer was knighted in 1897; he received honorary degrees from Cambridge, Oxford, Glasgow, Aberdeen, Edinburgh, and Sheffield; and in 1903–04 he served as president of the British Association for the Advancement of Science. His contributions to the knowledge of the physical condition of the heavenly bodies are valuable. He also carried out spectroscopical researches on the chemistry of the sun, for which he was granted the Rumford medal by the Royal Society in 1874. He discovered, simultaneously with Dr. Janssen, the possibility of successful observations of the solar prominences in broad daylight by means of the spectroscope. His name appears together with that of Dr. Janssen on a medal struck by the French government in 1872 in commemoration of the discovery. He also advanced the theory of the origin of cosmical systems, according to which the various orders of the heavenly bodies are alike composed of meteorites. The assumption that there exists a relation between the number of sun spots and the rainfall on the earth is due to his investigations. Among his publications may be mentioned: *Elementary Lessons in Astronomy* (1868–94); *Questions on Astronomy* (1870); *Contributions to Solar Physics* (1873); *Star-Gazing, Past and Present* (1877); *Studies in Spectrum Analysis* (1878); *Report to the Committee on Solar Physics on the Basic Lines Common to Spots and Prominences* (1880); *The Movements of the Earth* (1887); *The Chemistry of the Sun* (1887); *The Meteoritic Hypothesis* (1890); *The Dawn of Astronomy* (1894); *The Sun's Place in Nature* (1897); *Recent and Coming Eclipses* (1900); *Inorganic Evolution as Studied by Spectrum Analysis* (1900); *The Influence of Brain Power in History* (1903); *Stonehenge and Other British Stone Monuments Astronomically Considered* (1906; 2d ed., 1909); *Education and National Progress: Essays and Addresses, 1870–1905* (1907); *Surveying for Archæologists* (1909); *Tennyson as a Student and Poet of Nature* (1910). He also made numerous contributions to the *Proceedings* of the Royal and the Royal Astronomical societies.

LOCLE, lô'kl', LE. A town of the Canton of Neuchâtel, Switzerland, situated on the French frontier, 5 miles southwest of La Chaux-de-Fonds (Map: Switzerland, A 1). The town is famous for its watchmaking industry, founded at the beginning of the eighteenth century by D. J. Richard. It has been rebuilt since a fire in 1833, and contains among its educational buildings an imposing college, a watchmaking institute, a mechanical school, various secondary and industrial schools, besides industrial, scientific, and art museums, and a library. The streets are lighted by electricity. Pop., 1900, 12,600; 1910, 12,759.

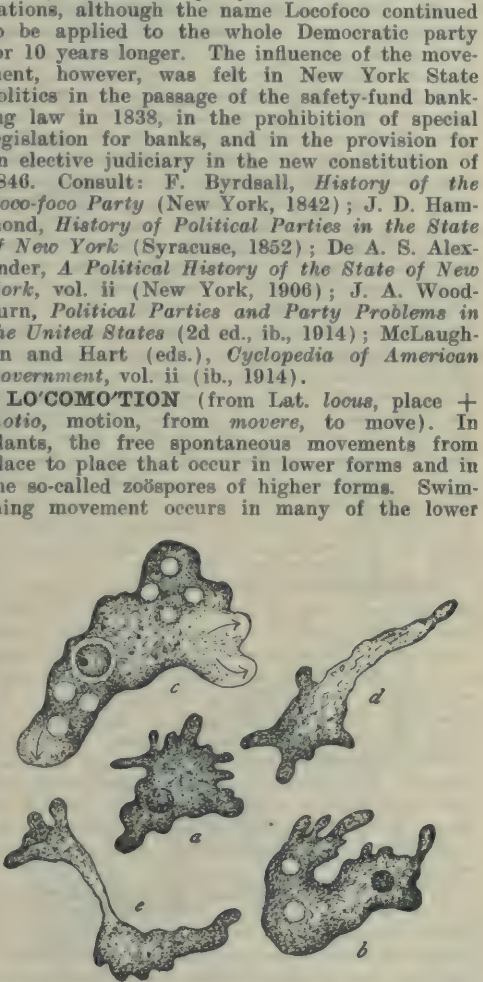
LO'CO (Sp., crazy) **DISEASE.** A disease of sheep, horses, and occasionally cattle, caused by certain species belonging to the botanical order Leguminosæ, popularly known as loco or crazy weeds, and widely distributed over the grazing ranges of the Rocky Mountains, where they occasion extensive losses. The most common species are *Astragalus mollissimus*, or purple loco weed, and *Aragallus lamberti*, or white loco weed. The disease may be called a pernicious habit, which is readily acquired by healthy animals through imitation of locoed animals, consisting in the persistent search for and almost exclusive feeding upon loco weeds. Animals that have once contracted the habit and are confined in fields or pastures free from loco weeds in order to effect a cure soon return to the old habit when turned out to range. They are therefore of no value as range stock. The first effects are stimulant, but continued use produces opposite results. The disease may appear in an acute or a chronic form. In the acute form the animal manifests signs of vertigo, moves about in circles, champs the jaws, and seems to be more or less deaf and blind. Death may occur within three days. In the chronic form the animal may linger for months or even years, losing flesh, exhibiting muscular incoördination and various nervous symptoms, finally becoming unable to walk, and dying of starvation or exhaustion. Locoed sheep sometimes shed the fleece. Locoed horses generally stand by themselves on the range; usually move

LOCO WEED.

about very little during the later stages; sometimes they do not drink oftener than once in two or three weeks; frequently they are unsteady and stiff and unduly frightened by ordinary objects; and when driven may run away at any time without apparent reason. No specific medicinal treatment for loco disease has been discovered; cathartics and tonics should be administered and potassium permanganate may be administered in acute cases to oxidize and destroy the poisonous alkaloid contained in loco weeds. Locoed sheep should be confined in feeding corrals and fattened upon alfalfa and roots for market; locoed horses may develop, under judicious feeding, into valuable work animals. All animals addicted to eating loco weeds should be separated from their companions in order to check the spread of the habit. Consult C. D. Marsh, "The Loco-Weed Disease," in *United States Department of Agriculture, Farmers' Bulletin, No. 380* (Washington, 1909). See ASTRAGALUS.

LO'COFO'CO (from Lat. *locus*, place + *focus*, hearth, fire; formed on the analogy of *locomotive*, ignorantly supposed to mean 'self-moving'). In American political history, the name applied originally to the radical or Equal Rights faction of the Democratic party in New York State, in 1835–37, but afterward used by the Whigs to designate the Democratic party generally throughout the nation. The system of granting bank charters in New York by special legislation for each case had given rise not only to favoritism and partisanship, but to bribery, purchase, and open fraud. The activity in chartering new banks in 1834–35, caused by the certainty that the United States Bank would not be rechartered, increased the scandal, and at last aroused some of the New York City Democrats to action. During the summer of 1835 several meetings were held for the purpose of effecting an organization which, at the approaching election, should support only candidates declaring their opposition to special bank legislation and its attendant evils. A mass meeting of this faction was held at Tammany Hall on Oct. 29, 1835, to act upon the report of a special nominating committee. The regular or Tammany Democrats, entering by the back stairs, attempted to control the meeting, but, finding the opposition too strong, turned out the gas and retired, leaving the reformers in darkness. The victors, however, were well provided with candles, which they lighted with *locofoco*, or friction, matches, and proceeded to act on the nominations. The incident of the lights was seized upon by the Democratic press, which derisively dubbed the antimonopolists Locofocos. In January, 1836, a county convention was held at which the new party took the name of the Equal Rights party, and adopted a statement of rights, in which it declared among other things that no legislature had the right to exempt corporations by special charters from the operation of any law, or to grant them special privileges, and that paper money was a vicious circulating medium and gold and silver the only safe and constitutional currency. In the spring elections of 1836 the party nominated candidates for mayor and aldermen, who polled over 3000 votes. On September 15 following a State convention was held at Utica which nominated candidates for Governor and Lieutenant Governor. In New York City, Congressional, Senatorial, and Assembly nominations were made. The Whigs indorsed four of the nominees and they were elected. In the spring city elections of 1837 the party held the balance of power, the vote cast for their mayoralty candidate throwing the city government into Whig hands. A second State convention held at Utica in September, 1837, framed a new State constitution, one of the features of which was the provision for an elective judiciary. President Van Buren's message to the special session of Congress that met in that same month, by adopting almost the identical grounds on financial matters held by the Equal Rights party, did much to bring the mass of the reformers back into the Democratic ranks, a result which was further hastened by the refusal of some of the Whig-Locofoco fusion candidates to live up to their pledges. The party made no more nominations, although the name Locofoco continued to be applied to the whole Democratic party for 10 years longer. The influence of the movement, however, was felt in New York State politics in the passage of the safety-fund banking law in 1838, in the prohibition of special legislation for banks, and in the provision for an elective judiciary in the new constitution of 1846. Consult: F. Byrdsall, *History of the Loco-foco Party* (New York, 1842); J. D. Hammond, *History of Political Parties in the State of New York* (Syracuse, 1852); De A. S. Alexander, *A Political History of the State of New York*, vol. ii (New York, 1906); J. A. Woodburn, *Political Parties and Party Problems in the United States* (2d ed., ib., 1914); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. ii (ib., 1914).

LO'COMO'TION (from Lat. *locus*, place + *motio*, motion, from *movere*, to move). In plants, the free spontaneous movements from place to place that occur in lower forms and in the so-called zoöspores of higher forms. Swimming movement occurs in many of the lower algæ and fungi, in zoöspores of higher algæ, and in sperms of mosses and ferns. It is found as far up the scale of plant life as the gymnosperms, the Cycads, and Gingko, in which the male cells are freely motile. A creeping (amœboid) movement over a moist surface occurs in the masses of naked protoplasm (plasmodia)



AN AMŒBA.

Sketched at intervals of half a minute. Cf. particularly *d* and *e*. The smaller end of *e* will probably next move into the larger, thus effecting translation.

which constitute the vegetative stage of slime molds. Swimming movements are usually due to the rapid lashing of long or short protoplasmic processes (cilia) which propel the organism through the water. They are very minute and often numerous, the entire surface of some zoöspores (e.g., those of Vaucheria) being covered with them. Sometimes, however, there are four, three, two, or only one. In such cases they are longer than when more numerous. A single large cilium is often termed a flagellum.

The mechanism of the movement of diatoms is not yet fully known. Some forms creep by means of protrusions of the protoplasm through the slit (raphe) which traverses the siliceous wall lengthwise. Amœboid movements are brought about by a flowing motion of the naked protoplasm which composes the organism. One or more processes form on one side of the body and elongate and the plasma flows slowly away from other regions to enter these processes. If this be continued in one direction the whole protoplasmic mass may creep over the substratum, material being thrust out in front and drawn in from behind. It has been suggested that this form of movement is due to variations in the surface tension of the protoplasmic mass. These variations may be due to unequal oxidation at different points on the surface. But nothing is known with certainty in this regard. It may be that the rotation of the protoplasm within certain walled cells is a form of amœboid movement.

Certain other forms of free movement which are sometimes confused with true locomotion are not the result of inherent energy at all, but are merely the effects of external forces. Such are the migrations of the wind-blown tumbleweeds, and of all winged seeds, pollen grains, etc. Also the movements of certain seeds provided with hygroscopic awns are purely physical. Alternate wetting and drying cause these awns to change their form and position and thus to displace the seeds or to force them into the earth. See MOVEMENT; ROTATION.

LO′COMO′TIVE (from Lat. *locus*, place + ML. *motivus*, moving, from Lat. *movere*, to move, Skt. *mīv*, to push). A steam engine and boiler mounted on wheels and so connected with them as to be capable of self-propulsion along a railway track; specifically, a railway engine. By extension the term has come to be applied to other motors than steam engines, which are similarly mounted and self-propelling, as compressed-air locomotives, electric locomotives, etc. The locomotive as a railway engine operated by steam is alone considered in this article. See COMPRESSED-AIR LOCOMOTIVE; ELECTRIC RAILWAYS.

Early History and Development. The locomotive engine was first developed for use on common roads (see AUTOMOBILE); it was not until 1804 that it was applied to railway operation by Richard Trevithick. Little is definitely known of the Trevithick locomotive first used on the Merthyr-Tydvil Railway beyond the fact that it had a return tubular boiler, a tall smokestack, into which the cylinder steam exhausted, and a cylinder 8 inches in diameter, and 4½-foot stroke. Another point which deserves to be noticed is that Trevithick recognized the sufficiency of the adhesion between a plain cylindrical wheel and a smooth rail for securing the necessary tractive power, but he recognized also that under certain conditions this adhesion would be insufficient and provided for toothed wheels and rails to be used in such cases. Trevithick's locomotive made no more than one or two trips on the Merthyr-Tydvil Railway. Commercially it was regarded as a failure. In hope of something better growing out of it, however, Mr. Blackett of the Wylam Colliery, near Newcastle-on-Tyne, wrote to Trevithick in Cornwall in 1809 with reference to the construction of another engine. Trevithick at first refused to consider the matter, but apparently reconsidered his decision; for in 1811 he sent a locomotive to Newcastle-on-Tyne, which for some reason was laid aside, and finally set to drive an iron foundry. In the same year (1811) Matthew Murray built for John Blenkinsop, the proprietor of the Middleton Colliery, near Leeds, a locomotive in which the steam cylinders operated a toothed wheel which engaged with a toothed rail laid alongside one of the track rails. In Murray's locomotive the boiler was cylindrical and horizontal, with slightly convex ends, and had a single internal flue in which the fire grate was placed at one end and out of which the chimney rose at the other. There were two steam cylinders located on top of the boiler and projecting downward into the boiler. The cylinders were upright and double-acting. Each piston rod was so connected with a pair of cranks, one on each side of the engine, as to drive a toothed wheel, the two wheels thus driven by the two pistons being made to gear with a larger toothed wheel

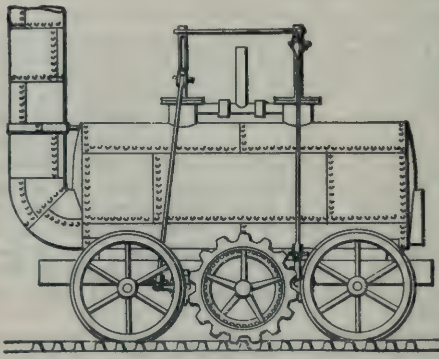


FIG. 1. MURRAY'S LOCOMOTIVE FOR BLENKINSOP'S RAILWAY, 1811.

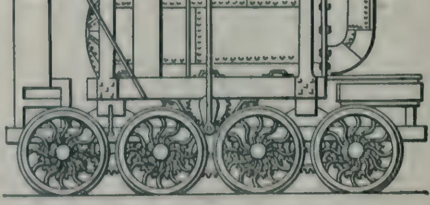


FIG. 2. HEDLEY'S ENGINE, 1815.

which meshed with the toothed rail. The engine was carried on four smooth wheels in the manner of an ordinary road wagon. Murray's engine is stated to have hauled a load of 30 loaded coal wagons weighing 94 tons at a speed of 3½ miles per hour on a level, and to have hauled 15 tons up a grade of 1 foot in 15 feet. While Murray's engine was being operated regularly between Middleton and Leeds, Mr. Blackett of Wylam with his engineer, William Hedley, was at work on a locomotive based on the one purchased from Trevithick as noted above. Mr. Hedley made first a series of experiments to determine the sufficiency for railway operation of the adhesion between smooth wheels and smooth rails. These experiments proving satisfactory, he designed and built his first engine in 1813. It had a cast-iron boiler, with a single internal flue, a cylinder 6 inches in diameter, and a flywheel. The engine worked by the adhesion of its driving wheels upon smooth rails. The boiler was deficient in steaming power and serious inconvenience was felt from the want of a second cylinder. The results were such, however, as to encourage Mr. Blackett to commission Mr. Hedley to make another and better engine. This engine had a wrought-iron boiler with a return flue, the chimney being placed at the same end as the fire box. Two vertical cylinders were employed, one on each side of the engine. The piston rods of these cylinders connected with beams the opposite ends of which were hinged, and the connecting rods were connected to the beams midway between the piston rod connections and the hinges and extended downward to cranks operating toothed wheels which, by means of a chain of gear wheels, operated the two pairs of wheels upon which the engine was carried. In 1815 another locomotive was built by Hedley similar to the one just described, but larger and heavier and having eight wheels instead of four wheels (Fig. 2).

The Hedley engines presented two notable advances over previous locomotives. The first was the use of a return tubular boiler and the second was the adoption of a smokestack of small diameter in which the exhaust cylinder steam could produce an effective draft. Almost before the practicability of Hedley's engines had been proved on the Wylam Railway, George Stephenson had recommended the adoption of locomotives by the managers of the Killingworth Colliery. It was finally decided to construct a locomotive, and the work was done in the colliery machine shops after the designs and under the direction of Stephenson. The engine which was finally turned out of the shops was supported on four wheels, and had a wrought-iron horizontal boiler 8 feet long and 34 inches in diameter, with a single internal flue 20 inches in diameter having a grate in one end and a 20-inch stack leading out of the other end. There were two vertical 8 × 24-inch cylinders, the motion of whose pistons was conveyed to the four driving wheels by an arrangement almost identical with that used by Hedley. The engine was greatly inferior to both Murray's and Hedley's engines previously described. Stephenson's first engine was completed on July 25, 1814, and the following year he completed a second. This engine was notable because of the fact that the pistons were linked directly to cranks on the driving wheels, and the toothed wheels and chain of gearing previously employed were abandoned. Briefly described, this engine had a horizontal cylindrical boiler with a vertical steam cylinder mounted on its top at each end. The piston rod of each cylinder was connected to the centre of a horizontal crosshead extending transversely across the boiler and long enough so that connecting rods attached to its two ends and extending downward to the cranks on the wheels would clear the boiler on each side. The two pairs of driving wheels were connected together by an endless sprocket chain to insure uniformity and coincidence of rotation. In later engines Stephenson substituted rigid side rods for the sprocket chain and supported a portion of the weight of the engine upon pistons contained in vertical cylinders beneath and communicating freely with the interior of the boiler, the pistons being made to press downward upon the bearings of the axles.

The engines built by Stephenson for the Stockton and Darlington Railway were substantially of the construction just described. They were not very satisfactory machines, and Timothy Hackworth, the locomotive engineer of this road, undertook to improve upon them. His engine, the *Royal George,* was completed in 1827. The boiler was a plain cylinder 13 feet long and 4 feet, 4 inches in diameter and had a return flue like the Hedley engines used on the Wylam Railway. There were six coupled wheels 4 feet in diameter, and the cylinders, which were placed at the end opposite the fire door and stack, were so arranged that they overhung the sides of the boiler sufficiently for the downward-projecting piston rods to clear it and to connect through connecting rods with cranks on the rear pair of wheels. These rear drivers were rigid, but the others had springs. The *Royal George* had a cistern into which a portion of the exhaust steam could be turned to heat the feed water; it also had short-stroke force pumps worked by eccentrics, adjustable springs instead of weights upon the safety valves, a single lever reversing gear, and a blast pipe by which the exhaust cylinder steam created a draft in the smokestack.

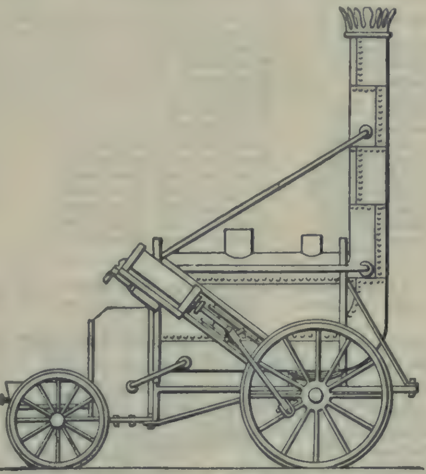


Fig. 3. STEPHENSON'S ROCKET, 1829.

Nothing further of importance respecting the mechanical development remains to be noted until the trials instituted by the Liverpool and Manchester Railway in 1829, which are noted in the article on Railways. Four locomotives were submitted to undergo this trial and three of them were actually tested. The result of the trial was the award of the prize to the *Rocket*, submitted by George Stephenson in the name of his son Robert Stephenson. The *Rocket* (Fig. 3) was a four-wheel engine supported on springs and, with a supply of water in the boiler, weighed 4 tons, 5 hundredweight. The boiler was a horizontal cylindrical vessel 6 feet long and 3 feet, 4 inches in diameter, traversed by 25 copper tubes 3 inches in diameter, through which the gaseous products of combustion were conveyed from a fire box at one end to a tall stack 12 inches in diameter at the other end. The fire grate was 3 feet wide and 2 feet long in the direction of the boiler, and the fire box was 3 feet deep and surrounded by a 3-inch water space which communicated with the boiler proper by means of two external pipes. The cylinders, placed in an inclined position, were fastened to the outside of the boiler near the fire box, the connecting rods working upon crank pins in the driving wheels, which were placed under the front end of the engine. The cylinders were 8 inches in diameter and had a stroke of 16½ inches; the driving wheels were 4 feet, 8½ inches in diameter. The exhaust steam from each cylinder was carried through a pipe and turned upward into the stack. As the result of the success of the *Rocket*, whose speed exceeded all expectations, the managers of the Liverpool and Manchester Railway ordered several locomotives from the Stephensons. These engines were, however, larger and heavier than the *Rocket*, some of them having 10 × 16-inch, and others 11 × 16-inch cylinders, with 5-foot driving wheels and weighing six and one-half and seven tons. The arrangement of the cylinders was substantially the same as on the *Rocket*, but they were less inclined. The tubes in the boiler were increased to from 90 to 92 in number and were reduced in diameter to 2 inches. A smoke box was also added to the boiler.

DIMENSIONS, ETC., OF EARLY ENGLISH LOCOMOTIVES

NAME	Railway	Date	Weight exclusive of tender, tons	Diameter of cylinders, inches	Length of stroke, inches	Diameter of driving wheels, ft. ins.	Area of fire grate, sq. ft.
Trevithick's	Merthyr-Tydvil	1804	....	(one) 8	54		
Murray's	Middleton	1811	....				
Murray's	Middleton	1829	6½				
Hedley's	Wylam	1813					
Stephenson's	Killingworth	1814	....	(two) 8	24	3 0	6
Stephenson's	Killingworth	1815	7½	(two) 8	24	3 0	7
Royal George	Stockton and Darlington	1827	11	(two) 11	20	4 0	
Royal George	Stockton and Darlington	1829	11	(two) 11	20	4 0	
Rocket	Liverpool and Manchester	1829	4½	(two) 8	16½	4 8½	6
Sanspareil *	Liverpool and Manchester	1829	4¾	(two) 7	18	4 6	10
Novelty †	Liverpool and Manchester	1829	2 7.10	(two) 6	12	4 2	1.8
Phœnix ‡	Liverpool and Manchester	....	....	(two) 11	16	5 0	6
Arrow ‡	Liverpool and Manchester	....	....	(two) 10	16	5 0	6

NAME	Railway	Date	Area of fire box surface, sq. ft.	Area of flue or tube surface	Gross load drawn exclusive of engine	Speed in miles per hour	Consumption of fuel per hour, lbs.	Evaporation of water per hour, cu. ft.
Trevithick's	Merthyr-Tydvil	1804	....	....	15	5		
Murray's	Middleton	1811	....	....	94	3½		
Murray's	Middleton	1829	....	....	140	3		
Hedley's	Wylam	1813						
Stephenson's	Killingworth	1814	10	20	40	5		
Stephenson's	Killingworth	1815	11½	29¾	50	5	coal 293	16
Royal George	Stockton and Darlington	1827	....	....	130	5		
Royal George	Stockton and Darlington	1829	....	....	72	11		
Rocket	Liverpool and Manchester	1829	20	117¾	12¾	13.8	coke 214	18¼
Sanspareil *	Liverpool and Manchester	1829	15.7	74.6	14¼	13.8		
Novelty †	Liverpool and Manchester	1829	9½	33	8	15		
Phœnix ‡	Liverpool and Manchester	....	20	306	41½	10	coke 323	34.4
Arrow ‡	Liverpool and Manchester	....	20	289	35½	12	coke 221	44

* Submitted in Liverpool and Manchester trials by T. Hackworth. † Submitted in Liverpool and Manchester trials by John Ericsson. ‡ Built for Liverpool and Manchester Railway by the Stephensons as result of success of *Rocket*.

Before taking up the next series of steps in the mechanical development of the locomotive a moment's attention should be given to the performances of the early engines so far mentioned. These are shown in the accompanying table, taken from Zerah Colburn's *Locomotive Engineering* (London, 1871).

The steep inclination of the cylinders of the Stephenson engines caused the machine to rise and sink on the springs at every double stroke, and at moderately high speeds the unsteadiness thus occasioned was considerable. Timothy Hackworth seems to have been the first to conceive of the plan of avoiding this trouble by placing the cylinders horizontally. On March 3, 1830, he made plans for a horizontal-cylinder engine for the Stockton and Darlington Railway, and laid them before the Stephensons, with orders to build an engine in conformity with them. These plans called for an engine with the following essential characteristics: The boiler was a horizontal cylinder with a single internal flue carrying a grate in one end, and the wheels were four in number, 5 feet in diameter and coupled. A copper steam dome was placed on the boiler, and from this feature the engine received its name of the *Globe*. The forward axle was the driving axle, and it had two cranks between or inside the wheels. The cylinders were horizontal and were located underneath the rear end of the boiler between or inside the rear wheels. Defined briefly as to its cylinders, the *Globe* was a horizontal, inside-cylinder, direct-connected locomotive. The *Globe*, according to Zerah Colburn, was not delivered to the Stockton and Darlington Railway until after the Stephensons, by whom it was being built, had embodied its arrangement of cylinders and driving axle in the *Planet*, the first inside-cylinder engine made by that firm for the Liverpool and Manchester Railway. This engine left Newcastle on Sept. 3, 1830, and was placed in operation on Oct. 4, 1830. Before the *Planet* had left Newcastle, however, Edward Bary, of Liverpool, had placed an inside-cylinder engine designed by Mr. Kennedy, his shop foreman and subsequent partner, on the Liverpool and Manchester Railway. This engine, known as the *Liverpool*, had four wheels of the then great diameter of 6 feet. The cylinders were placed nearly horizontally and side by side; the boiler contained a number of convoluted flues, and the fire was urged by bellows worked from beneath the tender. The *Liverpool* commenced working on July 22, 1830. Of the three locomotives the *Globe*, the *Liverpool*, and the *Planet*, the last was the only one which combined horizontal inside cylinders, a cranked axle, and a multitubular boiler. The *Planet* was the prototype of the modern English locomotive, and in it the locomotive engine assumed a definite and permanent form. It was the standard model of the locomotives built by the Stephensons for many years, and also the model from which both British and American engineers copied freely and minutely. The main dimensions of the *Planet* were as follows: Weight, loaded, 9 tons; weight of tender, 4 tons; cylinders, 11 × 16 inches; diameter of driving wheels, 5 feet; diameter of leading wheels, 3 feet; length of boiler, 6 feet; diameter of boiler, 3 feet; fire-box heating surface, 37¼ square feet; number of tubes, 129; diameter of tubes, 1⅝ inches; tube heating surface, 370 square feet; net load hauled, 76 tons at a maximum speed of 15½ miles per hour. To summarize briefly, the three inventors who stand highest in the long roll of those who have developed the railway locomotive are Richard Trevithick, Timothy Hackworth, and George Stephenson. As a true inventor Trevithick ranks first; as a noted authority well remarks, "it was he who first broke through the trammels of Watt's system of construction and low, if not negative, pressure; it was he who first employed the internal fireplace and internal heating surface; he was the first to create or promote a chimney draft by means of exhaust steam—the first to employ a horizontal cylinder and cranked axle, and to propose two such cylinders with the cranks at right angles to each other, the first to surround the cylinder with hot air, the first to draw a load by the adhesion of a smooth wheel upon a smooth iron bar, and the first to make and work a railway engine." Notwithstanding this note of its merits, Trevithick's genius was of an impracticable kind, and the practical engineering and business ability of Hackworth and Stephenson were necessary to develop the locomotive into a practical commercial machine. Hackworth stamped a character upon the structure of the locomotive engine which it still retains, while it is as the champion in that great contest against the ignorance and prejudice of the public which finally made the steam locomotive the unchallenged means of motive power for railways, that the name of George Stephenson must ever shine above the others.

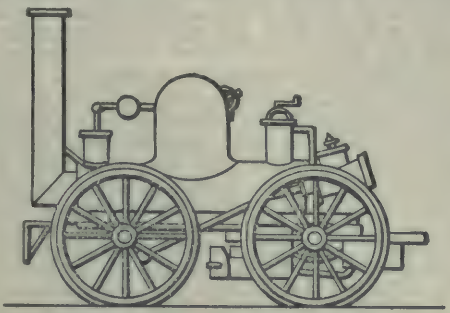


FIG. 4. DE WITT CLINTON, 1831.

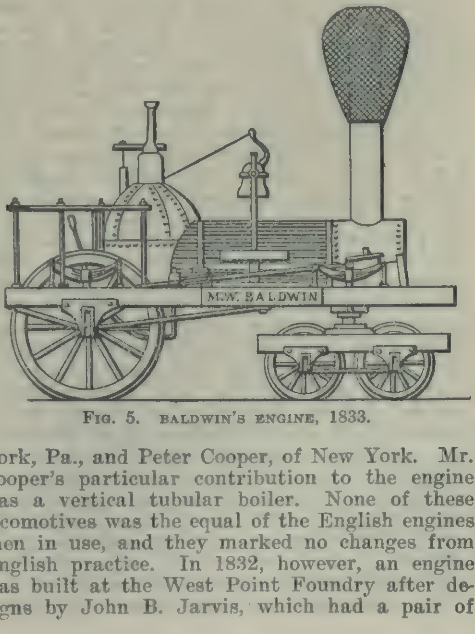


FIG. 5. BALDWIN'S ENGINE, 1833.

The development of the locomotive engine in America dates from 1830, when the *Best Friend*, designed by Adam Hall, and built at the West Point Foundry in New York City, was put at work on the Baltimore and Ohio Railroad. Locomotives had been previously used on American railways, but they were imported from England, while the *Best Friend* was of American construction and design. The *Best Friend* had a vertical tubular boiler, carried at one end of a horizontal platform or frame, while the cylinders were carried at the other end, and the four wheels occupied the space between the boiler and the cylinders. The cylinders were inclined, 8 inches in diameter, and 16-inch stroke, and coupled direct to the rear axle. The two pairs of wheels were coupled together by side rods. This locomotive was destroyed after working about six months by a boiler explosion. In 1831 the West Point Foundry built a second engine, which was put at work on the Mohawk and Hudson Railroad, now a part of the New York Central and Hudson River Railroad. This second engine, known as the *De Witt Clinton*, was very similar in general form to the first, but possessed several improvements. During the same year an engine resembling very closely the Hedley engines previously described was built by Phineas Davis, of York, Pa., and Peter Cooper, of New York. Mr. Cooper's particular contribution to the engine was a vertical tubular boiler. None of these locomotives was the equal of the English engines then in use, and they marked no changes from English practice. In 1832, however, an engine was built at the West Point Foundry after designs by John B. Jarvis, which had a pair of driving wheels and a four-wheeled swiveling truck. Ross Winans had already, in the previous year (1831), introduced the passenger car with swiveling trucks. The engine was designed to burn anthracite coal; the English locomotives all burned bituminous coal. Other engines were built by William T. James, of New York, Col. Stephen H. Long, of Philadelphia, Davis & Gartner, of York, Pa., and Robert L. Stevens, of Hoboken, N. J.

The origin of locomotive building as a commercial industry in America dates from 1832, when William Norris started a shop in Philadelphia, and from 1834, when Mathias Baldwin started a shop in the same city. Baldwin's first engine designed for actual railway operation was a close model of the English engines of the *Planet* class, but his second engine had a pair of driving wheels and a four-wheeled swiveling leading truck. The Norris engines were of the same general form as the second Baldwin locomotive. Some few of the engines turned out by these two builders were outside connected, i.e., the piston rods and connecting rods were outside the driving wheels, but this construction did not become common practice until later. A novel type of engine, known as the "grasshopper" engine, was produced about this time, having a vertical boiler and vertical cylinders, the piston being connected to a beam pivoted at one end and having at the other a connecting rod connecting by crank and gears with the driving wheels. One of these engines weighed 6½ tons and was operated at a speed of 12 to 15 miles an hour, doing the work of 42 horses at a cost of $16 for the round trip, as compared with $33 for horse haulage. In 1834 the Locks and Canals Company, of Lowell, Mass., and in 1840 Hinckley & Drury, of Boston, Mass., began building locomotives. The engines built by the latter firm were all outside-connected machines. The builders and inventors who have been named produced among them all the various features typical of the modern locomotive. It was necessarily given such form that it would work safely and efficiently on rough, ill-ballasted, and often sharply winding tracks; and it soon became evident that the two pairs of coupled driving wheels, the forward swiveling truck, the system of equalizing suspension bars by which the weight is distributed fairly among all the wheels, whatever the position of the engine or whatever the irregularity of the track, were essential features of a locomotive working under such conditions. Time, moreover, has shown that they were also excellent features for smooth roads.

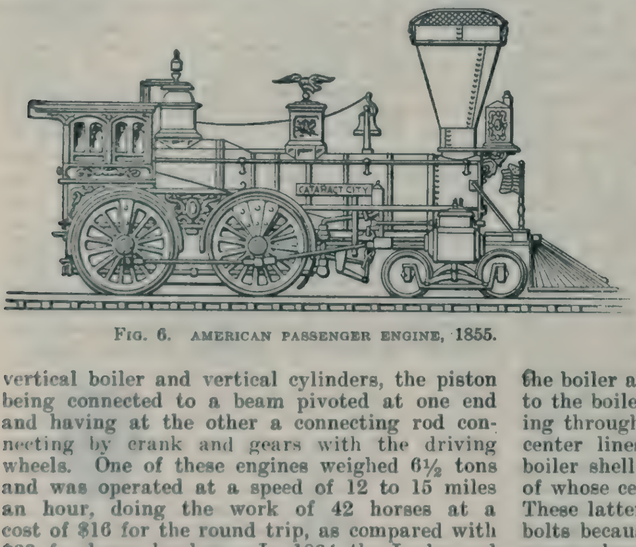


FIG. 6. AMERICAN PASSENGER ENGINE, 1855.

The cowcatcher, or pilot, placed in front to remove obstacles from the track, the bell, and the whistle were also American developments. The severity of the winter storms compelled the adoption of the cab, and the use of wood for fuel led to the invention of the spark arrester for wood-burning engines. Netting is now used in coal-burning locomotives to prevent the throwing of sparks. The sand box from which sand is led through pipes to the rails to prevent slipping of the driving wheels is also largely an American development.

Construction. Structurally a locomotive consists of a frame, the boiler and engine supported by it, and the running gear on which the whole travels along the track.

The boilers used upon locomotives are of a distinct type. They consist of an approximately cylindrical barrel with a furnace at one end and a smoke box at the other. Fig. 7 shows a longitudinal section through a boiler, and its principal attachments. The fire box proper consists of the side sheets, the top or more properly the crown sheet, the back or door sheet, and the back tube sheet, the front tube sheet being at the smoke-box end of the boiler. The fire box is placed inside a larger and similar shell which forms the rear end of the boiler, so that the fire box is entirely surrounded by water, the space between the fire-box side and end sheets and the corresponding sheets of the outer shell being termed the water space. The gases from the fire are carried to the smoke box through tubes, generally about 2 inches or 2¼ inches in diameter and supported in the front and back tube sheets. These tubes are entirely surrounded by water, the level of the water when there is a fire in the fire box being necessarily kept above the highest point of the crown sheet. A water glass and gauge cocks are provided on the back head of the boiler in the cab so that the engineman may determine the height of the water in the boiler at any time. The fire box is connected to the boiler proper by means of stay bolts passing through the water space as indicated by the center lines and also to the roof sheet of the boiler shell by means of longer stay bolts, some of whose centre lines are also indicated in Fig. 7. These latter are known as crown stays or crown bolts because of their being used to support the crown sheet. Crown bolts are generally known in the modern locomotive as radial stays because of their following approximately the lines of radii of the boiler roof sheet. Formerly the general practice was to use a series of transverse girders known as crown bars which were bolted to the crown sheet and supported by sling stays from the roof sheet. Stay bolts are either rigid or flexible. The rigid bolts are threaded and screwed through both sheets, while flexible bolts have a ball joint at the outer end to permit a slight relative movement of the sheets in expansion and contraction. The United States government requires all rigid stay bolts to be drilled at the outer end with a hole $\frac{3}{16}$ inch in diameter and 1¼ inches deep. These holes are called telltale holes, as in case a bolt breaks they will permit water to escape. In the Belpaire-type boiler it is now general practice to use stay bolts similar to the radial stays previously mentioned, but the roof sheet in this type of boiler is almost flat, while the side sheets near the top are almost vertical and are connected by transverse stays which pass above the crown sheet. The back head and front tube sheet are braced to the shell of the boiler by braces as indicated by the sloping centre lines in Fig. 7.

A Wootten fire box is one which is very wide and shallow, having a crown sheet curved at a large radius. It is used in anthracite-coal-burning locomotives, which require a large grate area because of the slow burning rate of this fuel. Oil is used to a considerable extent as a fuel for locomotives in the western United States and Mexico. It is carried in the tender and is fed, generally by means of a steam jet, into a brick-lined fire box. A combustion chamber, or an extension of the fire box into the boiler shell, is sometimes used, particularly in locomotives with long boilers where the tubes might otherwise be too long. Fire boxes in America are made of steel, as are boiler plates, tubes being either steel or iron. In Europe fire boxes and tubes are commonly made of copper. The fire in coal-burning locomotives is carried on grates, and an ash pan is provided beneath them. The grates are commonly of a rocking type, made of cast iron and with air spaces in them, but water grates are also used to some extent in anthracite-coal-burning engines. Water grates are formed by water tubes connecting the front and back water space of the fire box, with some of the tubes replaced by solid rods that may be drawn out when it is desired to dump the fires. The fire box in Fig. 7 is equipped with a brick arch which is supported on water tubes connecting the front and back water space. These tubes aid in the circulation of the water in the boiler; and while the more common practice is to support the brick arch in this way, it is sometimes carried by tee or angle irons. The brick arch is not in universal use, but is very generally employed in modern locomotives, its function being to force the hot gases to take as long a path as possible on their way to the tubes in order to give up a maximum of heat to the fire-box sheets, which are the most effective part of the boiler's heating surface. Passing through the tubes, where a large proportion of the remaining heat is transmitted to the boiler water, the gases enter the smoke box and are deflected downward by a diaphragm plate which may be either close to the front tube sheet at the top and sloping outward as it passes down towards the exhaust nozzle or may be vertical as shown in Fig. 7. The reason that this sheet is vertical in this case is that the locomotive is fitted with a superheater, the functions of which will be explained later. Draft is created by means of the exhaust steam from the locomotive cylinders, which passes through an exhaust pipe and an exhaust nozzle at the top of this pipe and upward through the stack. Various types of smoke box or front-end arrangements are employed, the one in Fig. 7 making use of a draft or petticoat pipe which is adjustable as to height in order that the force of the draft may be regulated to suit conditions, but the more common practice in modern locomotives is to omit this draft pipe entirely and use an inside extension of the stack terminating just above the exhaust nozzle. A netting indicated in Fig. 7 in front of the draft pipe extends across the smoke box, and in this case an adjustable apron is used just ahead of the exhaust nozzle. This apron is used to regulate the force of the draft in the same way as the draft pipe, and the gases pass under it through the netting, which prevents cinders of large size from being carried through the stack to the atmosphere. The diamond stack, which had a netting placed in it and was formerly used with a short smoke box, has given way universally to some form of open stack and extended smoke box similar to that in Fig. 7.

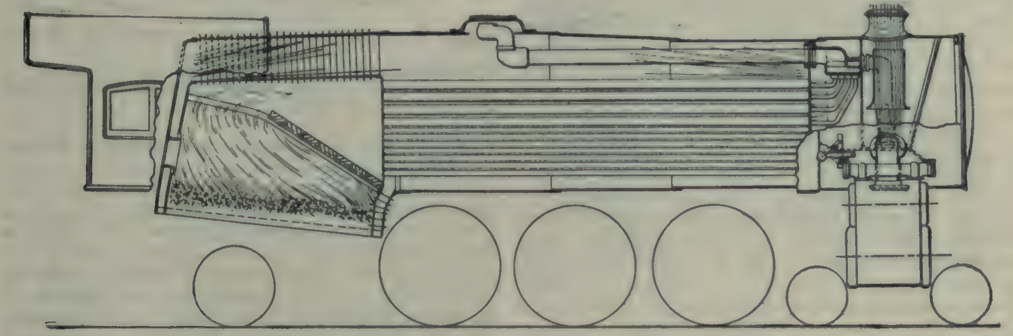


Fig. 7. LONGITUDINAL SECTION THROUGH A LOCOMOTIVE BOILER OF THE EXTENDED WAGON-TOP TYPE.

The types of locomotive boilers in general use are the wagon-top and its successor the extended wagon-top, the straight-top, the conical, and the Belpaire. The wagon-top boiler is cylindrical for some distance back from the smoke box and the diameter is then increased materially by means of one sloping course, the difference between the wagon-top and the extended wagon-top boiler being that in the latter this sloping course is always well ahead of the fire box, while in the former the front-end diameter was carried back almost to the fire box and the slope used to increase the amount of steam space directly over the crown sheet. The straight-top boiler, as its name indicates, is of practically the same diameter throughout its barrel, while the conical tapers gradually from end to end and is merely a modification of the extended wagon-top. The Belpaire type is, as previously stated, a form of construction at the fire-box end and may be used with a barrel of any of the other forms.

In order to obtain the steam for transmission to the cylinders as dry as possible, the throttle valve which controls the admission of steam to the cylinders is placed in a dome connected to the top of the boiler. This valve is controlled, by means of rods and levers, from the locomotive cab by the engineman, the pipe or bonnet which holds the valve being shown in Fig. 7, but not the rods and levers. In the ordinary locomotive, using what is known as saturated steam, the steam passes through the throttle valve to the dry pipe, which is supported in the barrel of the boiler above the tubes, and which passes through a hole in the front tube sheet and is connected by means of a casting known as the nigger head to the branch steam pipes which lead to the steam chests on either side of the locomotive. From the steam chests the steam passes to the cylinders through valves driven from the running gear and is there used to drive the locomotive. The boiler shown in Fig. 7 differs from the ordinary type of boiler in being equipped with a superheater, and as locomotives in large numbers are so equipped, a brief description is given below.

Saturated steam is steam in the form which it takes when it is generated from water by means of heat, and when it comes in contact with a surface cooler than itself a certain amount of it will be turned back into water, resulting in waste. In order to avoid the waste caused by the condensation of saturated steam in the steam chest and cylinders, the plan was hit upon of heating the steam to a still higher temperature after it had left contact with the water so that when this superheated steam comes in contact with a cooler surface it will necessarily give up heat to that surface but will not be immediately turned back into water.

When a boiler is equipped with a superheater a number of large tubes or flues, usually about 5 inches in diameter, replace a portion of the smaller tubes at the top. The steam, after leaving the throttle valve, passes through the dry pipe as before, but the dry pipe is in this case connected in the smoke box to a casing, usually of cast iron, and known as a header. To this header are connected return tubes, known as superheater elements, which pass back into the large boiler flues for some distance and return to a similar header which forms part of the same casting as the header previously referred to. This second header is connected to the branch steam pipes, which in turn connect with the steam chests. Locomotive superheaters vary in form to some extent, but the principle involved in all those in use is practically the same. The steam passes back through the elements referred to, which are absorbing heat from the gases passing through the large flues, and the steam in turn absorbs this heat and becomes superheated before passing through the second header and the steam pipes to the steam chests. The steam pipes were formerly connected to the saddle of the cylinders inside the smoke box, and passages in the casting then led it to the steam chest, but it has not yet been found practicable to use flat or slide valves to control the admission of superheated steam to the cylinders because of a detrimental action which the superheated steam has on this type of valve and its seat. When superheated steam is used, therefore, piston valves, which will be explained later, are invariably used, and it has been found more satisfactory to eliminate the long passages through the cylinder saddle and to carry the steam pipes directly to the steam chests through the sides of the smoke box as indicated in Fig. 7. The counterweight shown on the side of the smoke box in Fig. 7 is part of a damper regulator, this damper shutting off the large flues when the locomotive is drifting with the throttle closed, so that the hot gases will not come in contact with the superheater elements when there is no steam in them and burn them.

Among the necessary fittings of a locomotive boiler besides those already described are safety valve, whistle, steam gauge, water gauge, blower, throttle valve, and injectors.

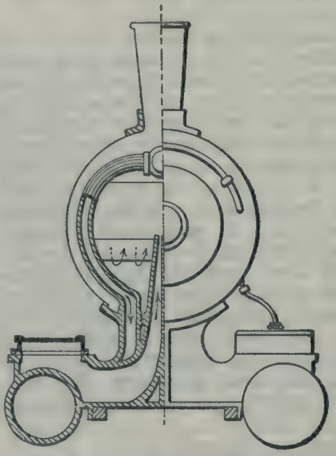


FIG. 8. SECTIONAL ELEVATION OF FRONT END OF A LOCOMOTIVE.

This locomotive differs from that in Fig. 7 in having no superheater and in being equipped with inside steam pipes and slide-valve cylinders.

Safety valves for locomotives are of the pop type, and two or more are employed. Fig. 9 is a section through a safety valve. The valve *a* rests upon the seat *b* and is held in place by the pressure of the spiral spring *d* bearing down on the spindle *c*. The pressure of this spring is regulated by screwing the collar *e* up and down. Outside of the valve seat there is a projection *f* beneath which a groove *g* is cut in the casing. When the valve lifts this groove is filled with steam which presses against the portion of the valve outside of the seat and, by thus increasing the effective area of the valve, causes it to rise higher and remain open longer than it would without this device. The adjustment of the

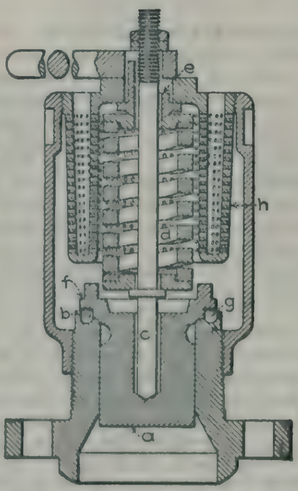


FIG. 9. LOCOMOTIVE SAFETY VALVE.

valve is so made that it will allow steam to escape until the pressure in the boiler is at a desired amount below the normal. The perforated casing or muffler *h* breaks the escaping steam into numerous single jets and thus reduces the noise of the escaping steam.

The *whistle* consists of a bell *A* (Fig. 10) closed at the top and sharpened at the lower edge. By opening the valve shown the steam escapes through the narrow circular orifice *B* and, entering the bell, sets up vibrations which cause the whistle. The tone is controlled by the size of the bell and the pressure of the steam, being lower the larger the bell is, and louder the greater the steam pressure is. Chime whistles are commonly used, and they consist usually of a bell having three compartments, tuned respectively to the first, third, and fifth of the musical scale. Five-chamber chime whistles are also used.

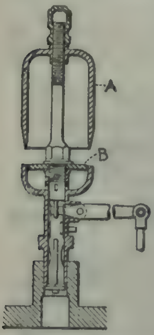


FIG. 10. LOCOMOTIVE WHISTLE.

The *blower* consists of a pipe leading from the cab to the stack, into which it turns upward, so that by opening a valve a jet of steam is sent up through the stack and gives a draft on the fire when the locomotive is standing still and when, consequently, the exhaust is not acting as previously described. The blower and other auxiliaries which require steam from the boiler usually receive it from a fountain or turret which is placed on top of the boiler in the cab and contains a number of valves for connection to the different auxiliaries.

The *throttle valve* in general use is a double-seated poppet valve, shown in section by Fig. 11. As will be seen, there are two valves, *a* and *b*, attached to a single stem. The upper valve, *a*, is the larger, and the lower valve, *b*, is of such diameter that it will pass through the upper valve seat. The steam, therefore, exerts a pressure on the lower face of *b* and on the upper face of *a*, so that the valve is partly balanced, but the valve *a* being larger than the valve *b*, the downward pressure is the greater and tends to keep the valve closed. Considerable force is required to raise the valve against this pressure, and in order that this may be exerted so as to task the strength as little as practicable, the lever arrangement shown is employed. The rod *e* comes from the cab, where it is controlled by the throttle lever in the hands of the engineman, is attached to the bell crank *d*, and this in turn is attached to the valve stem *E*. The point of the bell crank is provided with a slotted hole. At the start of the pull the length of the lever arm is about 2⅓ inches, while the long arm is 9½ inches. These figures vary to suit conditions. After the valve has been lifted from its seat and is free from the excess of pressure on *a*, the projecting horn *A* on the back of the bell crank comes in contact with the bracket *B*, and the crank takes the position shown by the dotted line in the drawing. The end of the horn then becomes the pivot, and the length of the short arm of the lever is changed to 9½ inches and the long arm to about 11½ inches. The dry pipe, as previously explained, is the steam pipe leading from the throttle valve to the engine cylinders, and is shown in Fig. 7. Injectors are used for delivering feed water to the boiler. See INJECTOR.

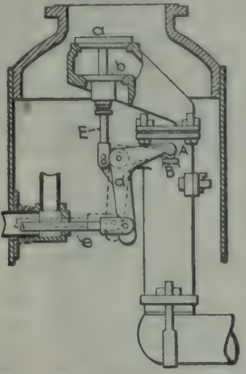


FIG. 11. LOCOMOTIVE THROTTLE VALVE.

The engine, or the mechanism for applying the pressure of the steam generated in the boiler to the rotation of the driving wheels, consists of the cylinders, pistons and piston rods, connecting or main rods, and the parallel or side rods, with their attachments and appurtenances. The cylinders are generally placed one on each side of the locomotive near the front end, as shown in Figs. 7 and 8. Each cylinder, with its valve seat in the case of slide-valve engines and the entire steam chest in piston-valve engines, usually forms one casting with the half saddle. The two half saddles are bolted together and the concave-topped saddle is then bolted to the smoke box of the boiler. The steam chest of a slide-valve engine is made separately and held in place by studs. The saddle affords a support for the boiler, and in turn rests on the frames, as shown in Fig. 8. The steam chest on each cylinder receives the steam from the boiler and contains the valve which admits it to the cylinder. Fig. 12 is a longitudinal section showing the inside of the cylinder and steam chest of a simple locomotive with slide valves. As will be seen, there is a steam port from the chest to each end of the cylinder and between them an exhaust port *b*, the latter connecting with the exhaust pipe and nozzle; the motion of the valve alternately opens and closes the steam ports so as to admit steam first at one end and then at the other end of the cylinder. In the drawing, Fig. 12, steam is shown entering the forward end of the cylinder and exhausting from the rear end. The valve in universal use for many years was a slide valve, roughly of D shape in section as shown in Fig. 12, but piston valves are now generally employed, and universally when superheaters are used. A piston valve is shown in the succeeding section on compound locomotives.

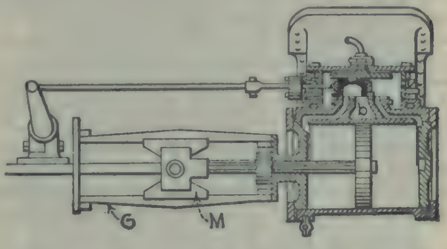


FIG. 12. SECTION THROUGH SLIDE VALVE, CYLINDER, AND STEAM CHEST.

Its principle is the same as that of the slide valve, but it is cylindrical and works in a cylindrical steam chest. The valves are oiled through oil pipes fed from lubricators placed either in the cab or on the running board. The sliding motion of the valve is controlled by a valve stem which connects with a valve rod driven by the valve gear. Various forms of valve gear are employed. The one in most extensive use for many years was the Stephenson link, the operation of which is explained in the article on steam engines. In heavy locomotives, however, the Stephenson gear is difficult to operate because of the weight which has to be lifted, and the parts wear out quickly. This has led to the almost universal use of a valve gear driven from the outside, having connections to the main crank pin and the crosshead.

The valve gear is controlled from the cab by means of a lever known as the reverse lever. Power reverse gear, generally steam, or a hand wheel and screw are much used in modern heavy locomotives in place of a lever. Inside the cylinder works the piston. This is a more or less disk-shaped structure of metal and is made in various ways, but always so as to fit the cylinder steam-tight by means of cast-iron rings sprung into grooves in the piston and bearing against the cylinder walls. The piston must be of ample strength, as it has to convey the pressure of the steam to the piston rod. The piston rod is circular in section and made of forged steel. It passes through the back cylinder head by means of a circular orifice packed so as to be steam-tight and yet allow for the movement of the rod. At its rear end the piston rod connects with the crosshead *M*, working between the guides *G* (Fig. 12). In Fig. 13 are shown another form of crosshead and guides and also the arrangement of the main rod and the side rods for a locomotive with six drivers. Main and side rods are made of forged steel.

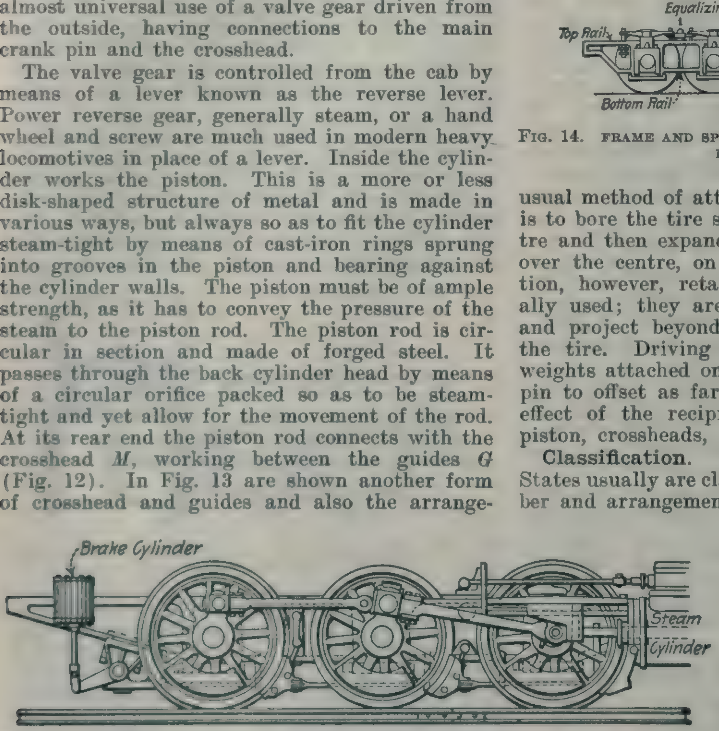


FIG. 13. DRIVING WHEELS, MAIN AND SIDE RODS, CROSSHEAD, GUIDES, PISTON ROD, VALVE ROD, AND BRAKE GEAR OF A LOCOMOTIVE.

The frame of a locomotive supports the boiler and engine on the wheels. In America bar frames are nearly always employed. Fig. 14 shows the frame and spring rigging for a freight locomotive (Consolidation or 2-8-0 type). It will be seen that the top and bottom rails of the frame are connected by vertical struts known as pedestal jaws, between which come the boxes of the driving wheels. These driving boxes have brass bearings which rest on the journals of the axle. On the bottom of the pedestal jaws are bars known as pedestal caps or binders. The number of jaws and style of frame are governed mostly by the number of driving wheels. Locomotives which have trailing wheels under the fire box have an additional frame spliced to the main frame, and the front rails, to which the cylinders are connected, are very often made separate and spliced to the main frame. In order to make an engine ride easily and to reduce the effects of the shock and concussion, the locomotive is provided with springs placed over each driving box and carried on a saddle which straddles the frame and rests on the driving box, as shown by Fig. 14. In order to equalize the weight between drivers there are provided bars between the springs which are called equalizing bars. In underhung spring rigging the springs are under the driving boxes and the weight is transferred to the latter by rods hooked over their tops or by a saddle supported at the bottom of the box.

Driving wheels are made with cast-iron or cast-steel centres, with a forged-steel tire. The usual method of attaching the tire to the centre is to bore the tire slightly smaller than the centre and then expand it by heating until it slips over the centre, on which it shrinks. In addition, however, retaining rings are very generally used; they are bolted to the wheel centre and project beyond the inner circumference of the tire. Driving wheels have counterbalance weights attached on the side opposite the crank pin to offset as far as possible the unbalancing effect of the reciprocating parts, such as the piston, crossheads, etc.

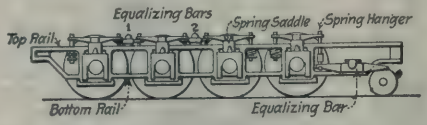


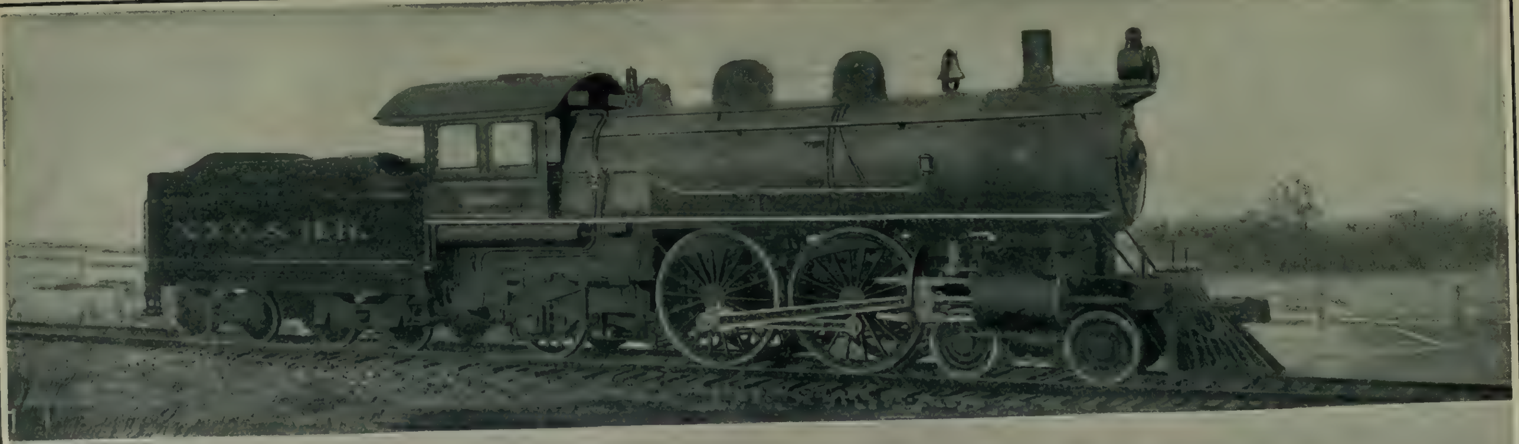
FIG. 14. FRAME AND SPRING RIGGING FOR A CONSOLIDATION LOCOMOTIVE.

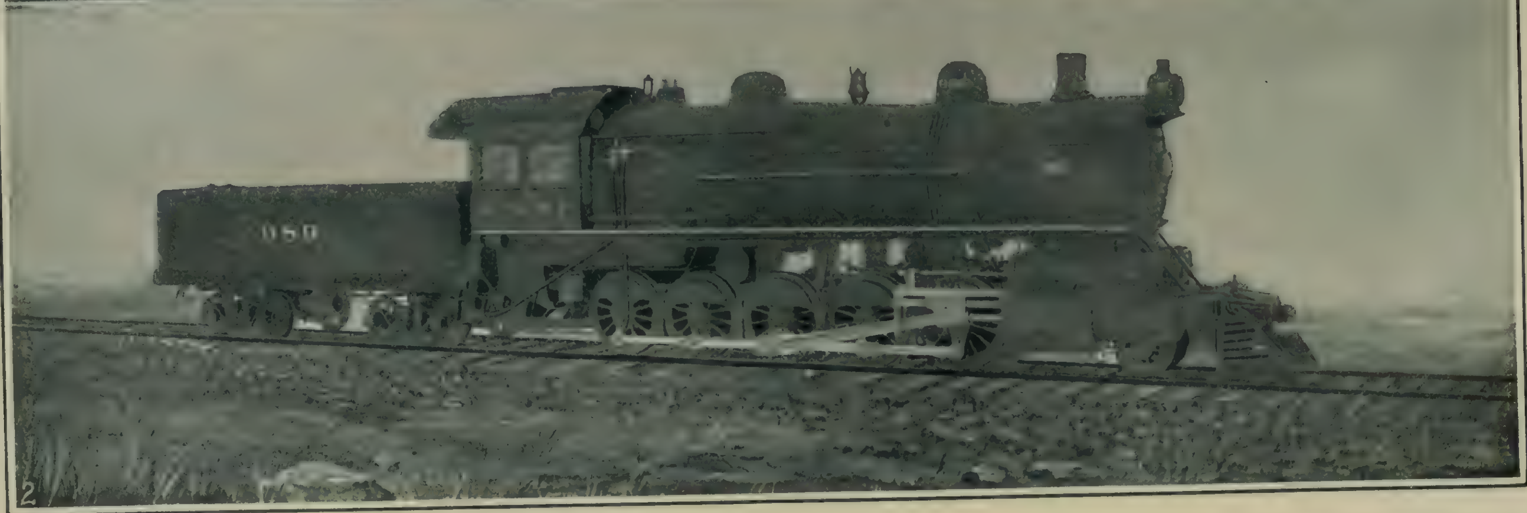
Classification. Locomotives in the United States usually are classified according to the number and arrangement of their driving and truck wheels. A Mogul type locomotive, which has a two-wheel leading truck, three pairs of driving wheels, and no trailing wheels, is designated as a 2–6–0 type; a Pacific type locomotive, with a four-wheel leading truck, three pairs of driving wheels, and two trailing wheels, is designated as a 4–6–2 type; while a Mallet articulated locomotive, with two leading truck wheels, two sets of drivers of three pairs each, and two trailing truck wheels, would be termed as 2–6–6–2 type.

The American or eight-wheel (4–4–0) type locomotive was standard for passenger service in America for many years, while the Mogul (2–6–0) was much used for freight. In passenger service the Atlantic (4–4–2) type succeeded the American to a large extent, the ten-wheel (4–6–0) type also being much used for both passenger and freight service, while heavier freight-train loads brought the Consolidation (2–8–0) type into very general use. The demand for increased boiler capacity led to the general adoption of locomotives in which the boiler was lengthened by adding a pair of trailing wheels to the engine, and this brought into general use the Pacific (4–6–2) type for passenger service and the Mikado (2–8–2) type for freight service.

Some of the more common types are: 0–6–0, 0–8–0, and 0–10–0 switching locomotives; Mogul

LOCOMOTIVES





1. CENTRAL ATLANTIC TYPE PASSENGER LOCOMOTIVE. This type of engine hauled the Empire State Express between Syracuse and Rochester in 1903.
2. DECAPOD TYPE HEAVY FREIGHT LOCOMOTIVE. Designed for Mountain Service.

Built by American Locomotive Company.

(2–6–0); Consolidation (2–8–0); Mikado (2–8–2); twelve-wheel (4–8–0); Santa Fe (2–10–2); American (4–4–0); Atlantic (4–4–2); ten-wheel (4–6–0); Pacific (4–6–2); Mountain (4–8–2); and Mallet compound locomotives of various wheel arrangements such as 0–6–6–0, 0–8–8–0, 2–6–6–2, 2–8–8–2, 2–6–6–0. There is in service one locomotive which has a wheel arrangement designated as 2–8–8–8–2. This machine has an additional set of engines and driving wheels under the tender.

Compound Locomotives. The compound locomotive is one in which the steam is admitted to one cylinder called the high-pressure cylinder, where it partially expands in doing its work, and whence it exhausts either into a receiver pipe or directly into the steam chest of a larger cylinder, called the low-pressure cylinder, where it completes its expansion and finishes its work, being then exhausted to the atmosphere in the ordinary way. The compound principle has been applied to locomotives in several ways: (1) two-cylinder compounds, with a cylinder on each side; the steam passes from the high-pressure cylinder on one side through the smoke box and across the engine to the low-pressure cylinder on the opposite side; (2) three-cylinder compounds, with a high-pressure cylinder on each side, the steam from which exhausts into a low-pressure cylinder beneath the smoke box (this type is not used in America); (3) four-cylinder compounds, with a high-pressure and a low-pressure cylinder on each side of the engine, each pair working independently of the other; (4) four-cylinder balanced compounds (so called because the four cranks, set 90 degrees apart, nearly balance one another), with two inside high-pressure and two outside low-pressure cylinders; (5) Mallet articulated compounds, which have two high-pressure cylinders driving one set of driving wheels and two low-pressure cylinders driving another set.

Recent Developments. Between 1890 and 1920 the American locomotive experienced a wonderful development. In 1890 in America an eight-wheel (4–4–0 type) locomotive with 18 × 24-inch cylinders and a boiler having about 2200 square feet of heating surface was in quite general use for first-class passenger service; the weight on the drivers seldom exceeded 65,000 pounds, and the total weight of the engine was usually within 100,000 pounds in working order. In freight service engines weighing between 100,000 and 120,000 pounds on the drivers were considered powerful locomotives. The standardized Pacific-type locomotive for passenger service built for the United States Railway administration had 79-inch-diameter driving wheels, 27 × 28-inch cylinders, 200 pounds boiler pressure, 3824 square feet of heating surface, 70.8 square feet of grate area, 43,800 pounds tractive effort, a total weight (excluding the tender) in working order of 306,000 pounds, and a weight on drivers of 197,000 pounds.

By 1922 it was evident that even the Pacific type of locomotive was not capable of making the requisite time with the express trains and the Mountain type was taking its place.

The greater part of the freight traffic in the United States is now handled by locomotives either of the Consolidation or Mikado type with four pairs of coupled drivers, while more powerful machines are those of the Santa Fe or the Mallet type, the latter of which is discussed in the next column. Data for two representative Santa Fe locomotives are included in the accompanying table.

The Mallet articulated compound locomotive first came into use in America in 1904, when one of this type (0–6–6–0) was built by the American Locomotive Company for the Baltimore and Ohio Railroad. Powerful locomotives of this type are used on the leading American railways where traffic and grades are heavy, as on the Virginia Railway. Dimensions of typical engines, as of the 2–8–8–2 type, are given in one of the accompanying tables, and it is of special interest to note that, although a low-speed machine, it has developed in service about 3000 horse power.

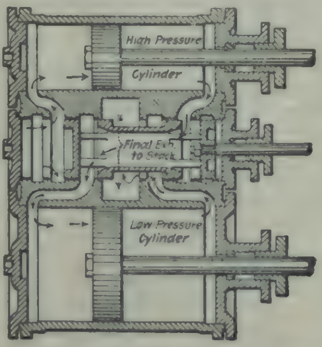


FIG. 15. CROSS SECTION OF CYLINDERS.

The Mallet articulated type takes its name from M. Mallet, the inventor, and the fact that it has an articulation or joint in the frame, the front of the boiler having a sliding bearing on the front running gear, so that in spite of its long wheel base the locomotive can negotiate sharp curves. Locomotives of this type have also been built with a flexible connection in the boiler corresponding to that in the frames, but only in limited numbers. Simple engines of this type have been built, but also in limited numbers. This principle, in 1914, was carried one step farther in a locomotive of the 2–8–8–8–2 type built by the Baldwin Locomotive Works for the Erie Railroad, in which the weight of the tender is used for adhesion by placing under it a set of cylinders and running gear. This locomotive has hauled a test train of 251 loaded cars, but is intended for and is employed in pusher service. The leading dimensions are given in one of the accompanying tables.

The Pacific (4–6–2) type was in most general use in passenger service and the Mikado (2–8–2) and the Consolidation (2–8–0) types in freight service, but as noted both heavier passenger and freight trains are requiring more powerful locomotives. The Santa Fe type is employed where a tractive effort of from 65,000 to 83,000 pounds is required. The use of superheaters and brick arches is now general and has done much towards economy in water and coal and increase in capacity. The mechanical stoker is in successful use on large numbers of locomotives of the larger types, where it also is an important factor in increasing capacity. Superheating by 1922 had been universally adopted in the construction of locomotives for passenger and freight trains. With the introduction of superheating the use of two-cylinder single expansion locomotives had increased, while for powerful engines the preference of the railways was divided between two-cylinder single expansion with superheater, the four-cylinder compound with superheater and the three or four-cylinder expansion with superheater.

This was the general opinion at the International Railway Congress in 1922. Here it was stated according to the summary in the Railway Age that:

"The fuel economy obtained by the application of superheat to the single expansion engines may be estimated on the average, in ordinary working conditions, to be about 10 to 20 per cent. This economy, however, is quite variable, according to the work done and the condition in which the parts are kept, and it is necessary to be more particular in this upkeep than with saturated steam engines. The special arrangements of valves and pistons of superheated engines have a tendency to become more uniform and simpler and more like those used on saturated steam locomotives. On new locomotives, piston valves are exclusively used for the high-pressure cylinders and packings, with sliding joints and outside cooling for rods acted on by live steam. The area of the cylinder relief valves has also been increased. These are the only special arrangements, the necessity for which has been universally recognized.

"Some administrations use at the same time both inlet and air valves and by-pass. The usefulness of this double action does not appear to be yet completely established. Corliss and similar type valves and the unaflow arrangement have made no progress."

In general, the tendency is towards larger locomotives, but also towards refinement in design and increase in capacity. The accompanying tables give the main dimensions of a number of representative freight and passenger locomotives which have been built in the United States during recent years.

Soon after the United States Government assumed control of all the trunk line railways of the United States, December 28, 1917, as a war-time measure, the director-general of the railroad administration appointed a committee to standardize the specifications for locomotives, and as a result of conferences in which operating men, engineers, and manufacturers participated, twelve sets of specifications and designs for locomotives, divided among eight types, were developed. Orders were placed for locomotives with the three leading locomotive manufacturers of the United States, two of which, the Baldwin Locomotive Works and the American Locomotive Company, built some to each of the standard specifications, while the Lima Locomotive Works confined their activities to a single type. These types represented the best practice at the time they were developed, and there have been but few essential developments since. A number of them are summarized in the accompanying tables.

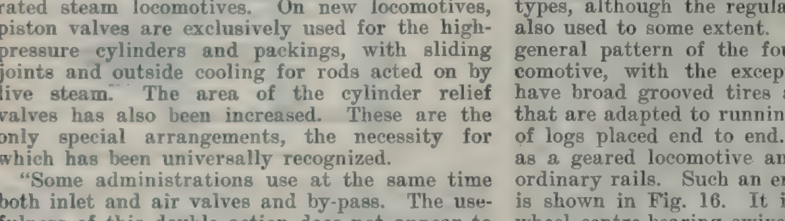
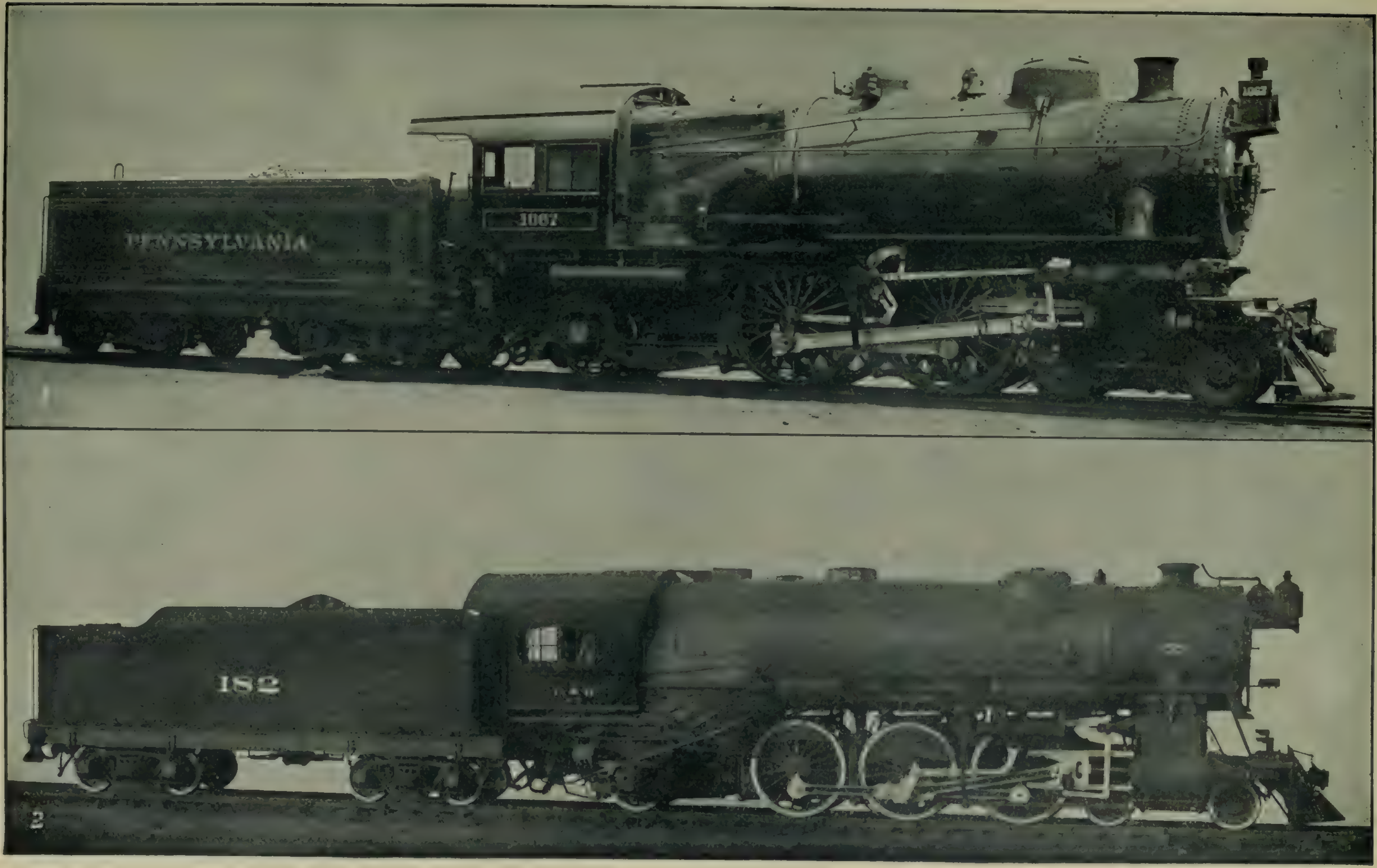


FIG. 16. GEARED LOCOMOTIVE FOR LOGGING RAILWAY.

European locomotives differ from those used in America chiefly in the following particulars: The American locomotive has a bar frame and carries its cylinders outside of the frame, while English and many European locomotives have a plate frame and usually carry the cylinders inside of the frame. The frame of the American engine usually rests on the wheels through the medium of equalizing springs, while equalizing springs are but seldom used on European engines. Eight-wheel tenders are almost universal in America, there being some twelve-wheel ones, while four-wheel and six-wheel tenders are used in Europe. The roomy cabs with seats for the engineman and fireman are peculiar to American engines.

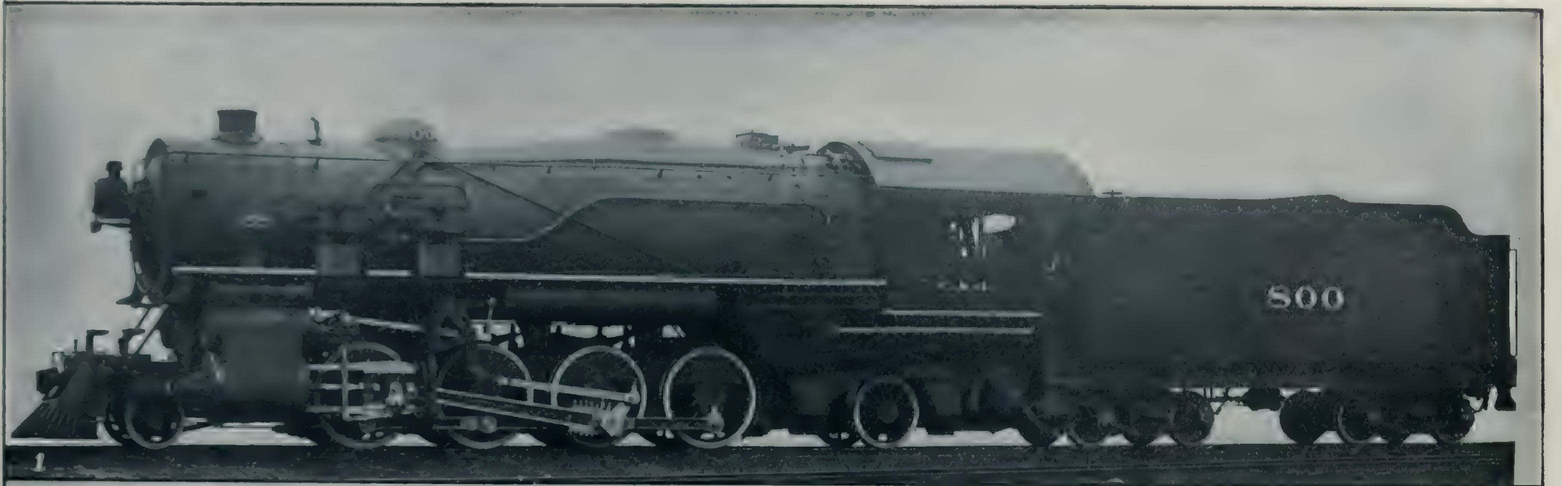
Logging Locomotives. The locomotives ordinarily known as logging locomotives are of two types, although the regular main-line types are also used to some extent. One is built after the general pattern of the four-wheel switching locomotive, with the exception that the wheels have broad grooved tires a foot or so in width that are adapted to running upon a track formed of logs placed end to end. The other is known as a geared locomotive and is fitted to run on ordinary rails. Such an engine of the Shay type is shown in Fig. 16. It is built on three four-wheel centre-bearing swiveled trucks, the wheels of which are driven by bevel gearing attached to the right-hand wheels of each truck with steel pinions meshing into them, carried by a shaft running in bearings attached to the journal boxes, and extending from axle to axle of each truck. The power is communicated in these pinion shafts with flexible couplings extending from the engines, which are placed vertically on the side of the boiler. This arrangement leaves each truck free to adjust itself to curves and irregularities of the track. The use of this locomotive is confined to roads having heavy grades and sharp curves, and it is restricted to low speeds.

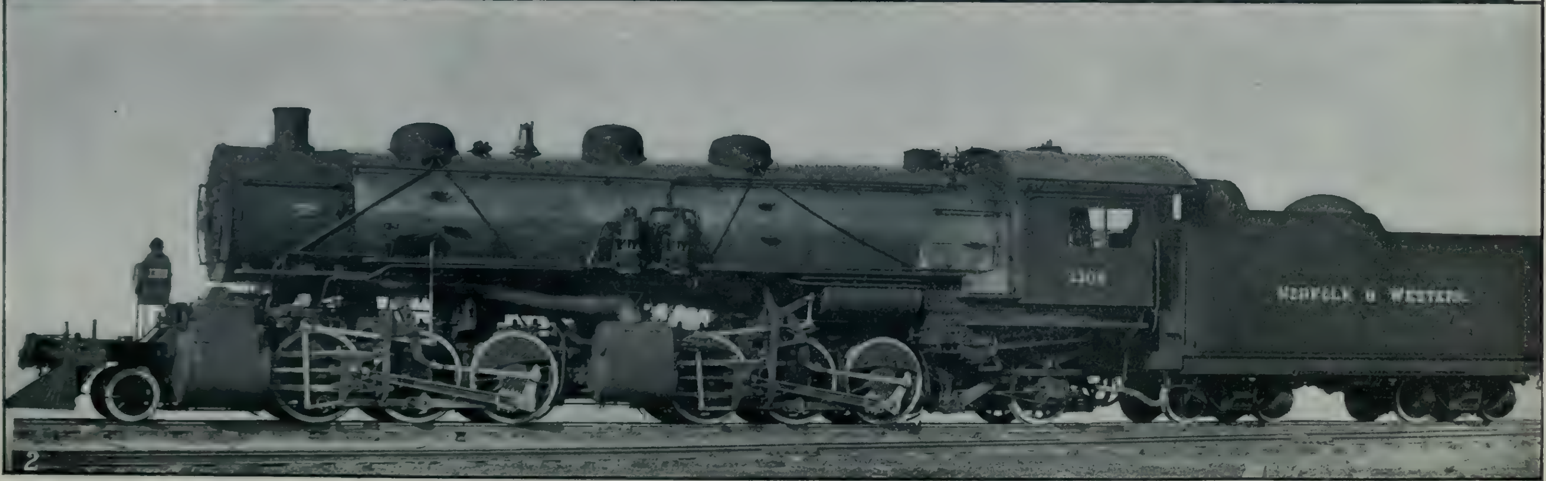
Rack Locomotives are used where the grades are too steep to be operated by the ordinary traction locomotive. The adhesion between the wheel and the rail of such an engine cannot be taken at more than 25 per cent of the weight on the drivers. Hence when the grade becomes so steep that the resultant of gravity acting parallel to the wheels becomes equal to 25 per cent of the weight on the driving wheels it will be impossible for the locomotive to advance. Such a grade is reached when the rise is 1320 feet to the mile. Practically it is much less than this. So on a grade of one-half of this the engine could at best only hold, not haul, itself and a load equal to its own weight. The weight of the locomotive (Fig. 17) is carried on smooth rails in the ordinary manner, and while the grade lies within the limits of its weight to overcome, it is propelled by driving wheels, like other engines. But when the grade becomes too steep the gear wheel is brought into mesh with a rack rail laid in the centre of the track between the other two.



AMERICAN PASSENGER LOCOMOTIVES

1. HIGHEST DEVELOPMENT OF THE ATLANTIC TYPE. LOCOMOTIVE BUILT IN 1914 BY THE PENNSYLVANIA RAILROAD
2. PACIFIC TYPE LOCOMOTIVE FOR HEAVY PASSENGER SERVICE





AMERICAN FREIGHT LOCOMOTIVES

1 MIKADO TYPE FOR HEAVY FREIGHT SERVICE
2 MALLET COMPOUND ARTICULATED LOCOMOTIVE FOR SLOW, HEAVY, FREIGHT SERVICE

Gasoline engines are used to considerable extent as the motive power for single cars on branch lines. This class of traffic is also taken care of in many instances by gas-electric cars in which the motors are furnished with current from a generator mounted in the car and driven by a gasoline engine. In both of these types the driving power is applied to one truck only. To a limited extent both of these systems have been applied to locomotives for switching service, and there are also in limited use gasoline locomotive.

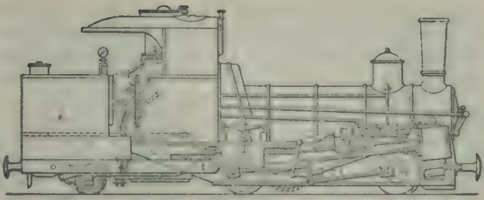


FIG. 17. LOCOMOTIVE FOR RACK RAILWAY.

Professor Stumpf, the inventor of the unaflow engine, has applied this type to locomotives, and in 1922 some 200 such locomotives were operating in Europe, while installations in the United

DIMENSIONS OF RECENT PASSENGER LOCOMOTIVES

Railway	Chesapeake & Ohio	Chesapeake & Ohio	Southern	N. Y., N. H. & H.	St. Louis Southwestern
Type	Mountain Heavy 4–8–2 U. S. Stand.	Mountain Heavy 4–8–2 U. S. Stand.	Mountain 4–8–2	Mountain Light 4–8–2 U. S. Stand.	Ten wheel 4–6–0
Builder	Baldwin Loco.	Am. Loco. Co.	Baldwin Loco.	Am. Loco. Co.	Baldwin Loco.
Maximum tractive effort	58,000 lbs.	57,900 lbs.	47,860 lbs.	53,900 lbs.	33,400 lbs.
Driving wheels, diameter	69 ins.	69 ins.	69 ins.	69 ins.	69 ins.
Wheel base, driving	18 ft. 3 ins.	18 ft. 3 ins.	18 ft.	18 ft. 3 ins.	15 ft.
Wheel base, total engine	40 ft.	40 ft.	38 ft. 11 ins.	40 ft.	26 ft. 2 ins.
Weight on drivers	243,000 lbs.	243,000 lbs.	209,800 lbs.	224,500 lbs.	165,200 lbs.
Total weight, engine in working order	352,000 lbs.	352,000 lbs.	314,800 lbs.	327,000 lbs.	209,400 lbs.
Weight of engine and tender, in working order	546,000 lbs.	545,700 lbs.	480,000 lbs.	519,060 lbs.	386,660 lbs.
Compound or simple	Simple	Simple	Simple	Simple	Simple
Cylinders, inches	28 x 30	28 x 30	27 x 28	27 x 30	22 x 28
Boiler, inside diameter of first ring	86 ins.	84½ ins.	76½ ins.	76⅝ ins.	72 ins.
Boiler pressure	200 lbs.	200 lbs.	190 lbs.	200 lbs.	200 lbs.
Fire box, inches	114⅛ x 96¼	114⅛ x 96¼	114⅛ x 84¼	120⅛ x 84¼	102 x 70
Tubes, number and diameter	247, 2¼ ins.	247, 2¼ ins.	183, 2¼ ins.	216, 2¼ ins.	212, 2 ins.
Flues, number and diameter	45, 5½ ins.	45, 5½ ins.	36, 5½ ins.	40, 5½ ins.	30, 5⅜ ins.
Tubes and flues, length	20 ft. 6 ins.	20 ft. 6 ins.	21 ft.	20 ft. 6 ins.	15 ft.
Heating surface, tubes and flues, sq. ft.	4,293	4,293	3,339	3,773	2,285
Heating surface, fire box, sq. ft.	220	335	222	320	173
Heating surface, total, sq. ft.	4,662	4,662	3,668	4,121	2,474
Superheater heating surface, sq. ft.	1,078	1,085	942	966	532
Grate area, sq. ft.	76.3	76.3	66.7	70.3	49.6
Water capacity of tender, U. S. gallons	10,000	10,000	9,000	10,000	9,000
Coal capacity of tender	16 tons	16 tons	12 tons	16 tons	15 tons

Railway	St. Louis, San Francisco	Erie	Erie	Atlantic Coast Line	So. Carolina Western Ex.
Type	Pacific 4–6–2	Pacific 4–6–2	Pacific 4–6–2	Pacific Light 4–6–2	American 4–4–0
Builder	Baldwin Loco.	Am. Loco. Co.	Baldwin Loco.	Am. Loco. Co.	Baldwin Loco.
Maximum tractive effort	45,800 lbs.	43,900 lbs.	43,800 lbs.	40,700 lbs.	18,200 lbs.
Driving wheels, diameter	73 ft.	79 ins.	79 ins.	73 ins.	62 ins.
Wheel base, driving	13 ft.	14 ft.	14 ft.	13 ft.	9 ft. 1 in.
Wheel base, total engine	33 ft. 11 ins.	36 ft. 2 ins.	36 ft. 2 ins.	34 ft. 11 ins.	24 ft. 3½ ins.
Weight on drivers	190,700 lbs.	197,000 lbs.	197,000 lbs.	162,000 lbs.	73,200 lbs.
Total weight, engine in working order	296,000 lbs.	306,000 lbs.	306,000 lbs.	277,000 lbs.	117,600 lbs.
Weight of engine and tender, in working order	487,000 lbs.	500,200 lbs.	500,200 lbs.	471,000 lbs.	208,000 lbs.
Compound or simple	Simple	Simple	Simple	Simple	Simple
Cylinders, inches	26½ x 28	27 x 28	27 x 28	25 x 28	18 x 24
Boiler, inside diameter of first ring	76½ ins.	76⅝ ins.	78 ins.	74⅝ ins.	58 ins.
Boiler pressure	200 lbs.	200 lbs.	200 lbs.	200 lbs.	170 lbs.
Fire box, inches	115 9/16 x 79	120⅛ x 84¼	120⅛ x 84¼	114⅛ x 84¼	78 1/16 x 33⅜
Tubes, number and diameter	225, 2¼ ins.	216, 2¼ ins.	216, 2¼ ins.	188, 2¼ ins.	246, 2 ins.
Flues, number and diameter	38, 5½ ins.	40, 5½ ins.	40, 5½ ins.	36, 5½ ins.	....
Tubes and flues, length	21 ft.	19 ft.	19 ft.	19 ft.	12 ft. ¼ ins.
Heating surface, tubes and flues, sq. ft.	3,916	3,497	3,497	3,072	1,538
Heating surface, fire box, sq. ft.	251	299	227	242	134
Heating surface, total, sq. ft.	4,200	3,824	3,824	3,341	1,672
Superheater heating surface, sq. ft.	996	887	882	794	....
Grate area, sq. ft.	63.5	70.8	70.8	66.7	18.2
Water capacity of tender, U. S. gallons	10,000	10,000	10,000	10,000	4,500
Coal capacity of tender	18 tons	16 tons	16 tons	16 tons	8 tons

States had been planned. In this type used extensively in stationary engines the steam flows through each end of the cylinder in one direction only, so as to reduce the losses in heat transfers.

In Europe efforts have been made to use the steam turbine in connection with the locomotive. In Switzerland a Zoelly turbine had been fitted to a locomotive in the Winterthur Locomotive Works, while in Sweden the Ljungstroms Steam Turbine Company had equipped a locomotive for the Swedish State Railway with a machine of their design which was reported to save 52 per cent in fuel. In England a turbine has been fitted to a locomotive with an electric transmission gear by Sir W. G. Armstrong, Whitworth and Company. In Italy a Belluzo turbine had been used on a small switching locomotive, and with the experience gained a specific type of road locomotive was equipped. In connection with the necessity for economy in fuel, another European development was the application to locomotives of the Diesel internal

DIMENSIONS OF RECENT FREIGHT LOCOMOTIVES

Railway	Erie	Carolina, Clinchfield & Ohio	Virginian	Southern Pacific Co.	C. B. & Q.
Type	Triplex Articulated 2–8–8–8–2	Mallet Articulated 2–8–8–2	Mallet Articulated U. S. Stand. 2–8–8–2	Santa Fe 2–10–2	Santa Fe 2–10–2 U. S. Stand
Builder	Baldwin Loco.	Baldwin Loco.	Am. Loco. Co.	Baldwin Loco.	Am. Loco. Co.
Maximum tractive effort	160,000 lbs.	104,000 lbs.	121,600 lbs.*	75,150 lbs.	73,800 lbs.
Driving wheels, diameter	63 ins.	57 ins.	57 ins.	63½ ins.	63 ins.
Wheel base, driving	16 ft. 6 ins.	15 ft. 6 ins.	15 ft. 9 ins.	22 ft. 10 ins.	22 ft. 4 ins.
Wheel base, total engine	91 ins.	57 ft. 4 ins.	58 ft.	42 ft. 4 ins.	42 ft. 2 ins.
Weight on drivers	766,300 lbs.	466,890 lbs.	478,000 lbs.	306,000 lbs.	293,000 lbs.
Total weight, engine in working order	860,350 lbs.	523,340 lbs.	531,000 lbs.	398,000 lbs.	380,000 lbs.
Weight of engine and tender, in working order	860,350 lbs.	710,000 lbs.	740,000 lbs.	621,000 lbs.	586,100 lbs.
Compound or simple	Compound	Compound	Compound	Simple	Simple
Cylinders, inches	All 36 x 32	28 & 42 x 32	25 & 39 x 32	29½ x 32	30 x 32
Boiler, inside diameter of first ring	94 ins.	90 ins.	95 11/16 ins.	90 ins.	86 7/16 ins.
Boiler pressure	210 lbs.	200 lbs.	240 lbs.	200 lbs.	190 lbs.
Fire box, inches	162 x 108	144⅛ x 96⅛	170⅛ x 96¼	132 x 90	132⅛ x 96¼
Tubes, number and diameter	326, 2¼ ins.	274, 2¼ ins.	274, 2¼ ins.	260, 2¼ ins.	271, 2¼ ins.
Flues, number and diameter	53, 5½ ins.	53, 5½ ins.	53, 5½ ins.	50, 5½ ins.	50, 5½ ins.
Tubes and flues, length	24 ft.	24 ft.	24 ft.	21 ft.	20½ ft.
Heating surface, tubes and flues, sq. ft.	6,418	5,685	5,685	4,722	4,727
Heating surface, fire box, sq. ft.	251	261	386	251	387
Heating surface, total, sq. ft.	6,851	6,123	6,120	5,103	5,153
Superheater heating surface, sq. ft.	1,584	1,595	1,475	1,329	1,208
Grate area, sq. ft.	121.5	96.2	96	82.5	88.2
Water capacity of tender, U. S. gallons	11,600	10,000	12,000	12,000	12,000
Coal capacity of tender	16 tons	15 tons	16 tons	4,000 gals. oil	16 tons

Railway	Atlantic Coast Line	C. M. & S. P.	Pennsylvania	Chicago Junction	New York Central
Type	Mikado 2–8–2	Mikado 2–8–2 U. S. Stand.	Consolidation 2–8–0	Switching 0–6–0	Switching 0–8–0 U. S. Stand.
Builder	Baldwin Loco.	Am. Loco. Co.	Baldwin Loco.	Am. Loco. Co.	Am. Loco. Co.
Maximum tractive effort	59,000 lbs.	60,000 lbs.	53,140 lbs.	39,100 lbs.	51,000 lbs.
Driving wheels, diameter	63 ins.	63 ins.	62 ins.	51 ins.	51 ins.
Wheel base, driving	16 ft. 9 ins.	16 ft. 9 ins.	17 ft. ½ ins.	11 ft.	15 ft.
Wheel base, total engine	35 ft.	36 ft. 1 in.	25 ft. 9½ ins.	....	....
Weight on drivers	223,200 lbs.	239,000 lbs.	226,900 lbs.	163,500 lbs.	214,000 lbs.
Total weight, engine in working order	280,700 lbs.	320,000 lbs.	249,500 lbs.	163,500 lbs.	214,000 lbs.
Weight of engine and tender, in working order	475,000 lbs.	503,800 lbs.	431,000 lbs.	332,300 lbs.	381,900 lbs.
Compound or simple	Simple	Simple	Simple	Simple	Simple
Cylinders, inches	27 x 30	27 x 32	26 x 28	21 x 28	25 x 28
Boiler, inside diameter of first ring	78 ins.	84½ ins.	78½ ins.	64 11/16 ins.	78 3/16 ins.
Boiler pressure	200 lbs.	190 lbs.	205 lbs.	190 lbs.	175 lbs.
Fire box, inches	120⅛ x 88	120⅛ x 84¼	110¼ x 72	72⅛ x 66¼	102⅛ x 66¼
Tubes, number and diameter	240, 2 ins.	247, 2¼ ins.	265, 2 ins.	158, 2 ins.	230, 2 ins.
Flues, number and diameter	36, 5⅜ ins.	45, 5½ ins.	36, 5⅜ ins.	24, 5½ ins.	36, 5½ ins.
Tubes and flues, length	16 ft. 6 ins.	19 ft.	15 ft. 1 in.	15 ft.	15 ft.
Heating surface, tubes and flues, sq. ft.	2,954	3,978	2,841	1,748	2,569
Heating surface, fire box, sq. ft.	231	279	175	130	190
Heating surface, total, sq. ft.	3,306	4,285	3,016	1,891	2,777
Superheater heating surface, sq. ft.	742	993	623	475	614
Grate area, sq. ft.	73.4	70.3	55	33.2	47
Water capacity of tender, U. S. gallons	9,500	10,000	8,000	8,000	8,000
Coal capacity of tender	12 tons	16 tons	34,600 lbs.	16 tons	16 tons

* Simple 101,300 lbs. Compound.

combustion engine, similar to that used on submarines, but up to 1922 only small special locomotives or motor cars drawing not more than one trailer had been constructed on this system.

Compressed-air locomotives are used for mine work and switching around shop plants, but the electric locomotive is preferred. Storage-steam or fireless locomotives are also used to some extent for switching about shops. See Fireless Engine. For electric locomotives see Electric Railways.

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LOCOMOTIVE ENGINEERS, Brotherhood of. See Railway Brotherhoods.

LOCOMOTIVE FIREMEN, Brotherhood of. See Railway Brotherhoods.

LOCOMOTIVES, Electric. See Electric Railways.

LO′COMO′TOR ATAX′IA (Neo-Lat., from Lat. *locus*, place + *motor*, mover, and Gk. ἀταξία, disorder, from ἀ-, α-, not + ταξία, *taxia*, order, from τάσσειν, *tassein*, to arrange), or Tabes dorsalis. A disease of the nervous system, commonly of the posterior root zones of the spinal cord, characterized by incoördination of movements and by sensory and trophic disturbances. The earliest account of the disease was given by Todd in 1847. Turck, in 1856, first described the pathological alterations in the spinal cord; and Romberg and Trousseau in 1858 further clarified the symptomatology. The clinical picture is not one of paralysis, but loss of power to order harmoniously the muscles that move the body and maintain equilibrium. It begins insidiously and grows slowly. The earlier symptoms are usually disorder of vision, a girdle sensation, with shooting pains through the limbs; increasing or perverted sensibility, and disturbance in the functions of the bladder and of the rectum resembling neuralgia or sciatica. Later, the patient feels that his walking is not firm and sure; that there is some soft substance between his feet and the ground; he walks with difficulty and with short, hurried steps; each leg is lifted well up, but as he moves it forward, it is thrown out from him, and the heel descends with force, while the sole comes awkwardly after it. He now requires the aid of vision to walk at all and looks steadily at his feet or at a point a little in front of them, and he cannot make a sudden turn without great risk of falling. If he stands erect with his feet together or nearly so, and closes his eyes, he begins to totter, and would fall if not supported (Romberg's sign). These phenomena are not primarily the result of weakness of motor power, but of defective muscular coördination. Diminished sensibility in the feet and legs is usual in this disease. The patellar reflex is lost. The upper limbs are sometimes affected, so that, though the hands retain all their natural muscular power, the sufferer cannot unfasten a button, or pick up a pin, or feed himself. As the disease progresses, this muscular incoördination (ataxia) increases until the person affected is unable to walk at all. Paralysis of various muscles may occur, notably of some of those of the eye. The involvement of the bladder produces a loss of the power of urination, and general weakness results in death. Although usually going to a fatal termination, the disease is sometimes arrested and appears to be quite conquered particularly in its earlier stages. In most cases it extends over several years. Locomotor ataxia arises from disease of a portion of the posterior spinal ganglia, later involving the posterior columns and the posterior nerve roots, which become atrophied and degenerated. The exciting causes are not well understood, but exposure to cold, overexertion, privation, intemperance, and mental anxiety have been suggested as probable. It is probable that syphilis (generally acquired, but sometimes hereditary) is the most important single cause, at least 70 to 95 per cent being due to this alone or to syphilis combined with alcoholism. Antisyphilitic treatment results in amelioration in many cases. It is more common among males than females. It is developed usually not till middle life, from the age of 30 to 50. Since the introduction of salvarsan better results are obtained. This drug is best given by injection directly into the spinal canal. Remarkable improvement has been noted in a considerable number of cases treated in this manner. Electricity has been recommended by eminent authorities. It is always necessary to attend carefully to the general health and regimen. Much can be done for the ataxia by systematic exercises carried out under a physician's instructions. Consult William Osler, *Practice of Medicine* (New York, 1912).

LOCO WEED. See Astragalus; Loco Disease.

LO'CRI, or Locri Epizephyrii. See Locris.

LO'CRIS (Lat., from Gk. *Λόκρις*, *Lokris*). A small district of ancient Greece (Map: Greece, Ancient, C 2). There was a legend which told of a King Locros, a descendant of Deucalion (q.v.), who ruled over the Leleges (q.v.) on the coast of the mainland opposite Eubœa, and whose wife, a daughter of the King of Elis, bore to Zeus a son Opus. Later, moved by the strife of his sons, Locros is said to have crossed the mountains to the southwest and to have formed a new settlement on the shores of the Corinthian Gulf. The Locrian tribes seem to have been forced asunder by the invasions from the north; in historic times two distinct tribes were known. The eastern Locrians, divided into the Opuntian Locrians and the Epicnemidian Locrians, dwelt opposite the island of Eubœa on the northeast coast of Greece. From these Locrians came Ajax, the son of Oïleus (q.v.). Their chief deity was Persephone. The western Locrians, called Ozolian Locrians, lived on the Corinthian Gulf, west of Phocis. Neither division played any prominent part in Greek history. Early in the seventh century B.C. a colony, probably of the Opuntian Locrians, settled at Cape Zephyrium in Magna Græcia, and a few years later moved to a site about 5 miles south of the modern Gerace, where they founded Locri Epizephyrii. This city never attained the prosperity of the great trading colonies, but seems to have been a prosperous farming community. It was celebrated for its severe but just code of laws, attributed to Zaleucus, who is said to have lived about the middle of the seventh century B.C. and to have been the first Greek to prepare a written code. So highly was his work esteemed that it is said to have remained unaltered for centuries. The Locrians won great fame by defeating the much more powerful city of Crotona (q.v.) in a bloody battle at the river Sagras, about 525 B.C., a victory which they ascribed to the personal intervention of the Dioscuri. The town was seized by the younger Dionysius, after his expulsion from Syracuse in 356 B.C., and ruled with the greatest tyranny until his return to Syracuse in 346 B.C., when the inhabitants rose and took a frightful vengeance on the members of his family who had been left behind. During the wars of Rome with Pyrrhus and Carthage the city was alternately occupied by the opposing parties, and its temple of Persephone was finally plundered by the Romans, who, however, made restitution later. Soon after, it seems to have declined in importance, but is mentioned by Procopius in the sixth century A.D. It was probably destroyed by the Saracens, about 915. In 1889 and 1890 excavations near Gerace brought to light the foundations of an Ionic temple, possibly that of Persephone or that of the Dioscuri. Consult *Römische Mittheilungen*, vol. v (1890) and *Antike Denkmäler*, i, 5 (1890). Excavations in 1890–91 yielded much more important results, such as archaic terra cottas, 14,000 *scyphi*, or cuplike vases, arranged in rows in tile-covered trenches, and important traces of the walls. In 1910 a small temple of Athene, a shrine of Persephone, and a pre-Grecian necropolis were discovered. Consult: *Notizie degli scavi*, for 1902, 1906, 1909, 1911, 1912; "Lokris" and "Lokroi Epizephyrioi," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

LO'CUS (Lat., place). The place of all points satisfying a given condition. For example, the circumference of a circle whose centre is O and whose radius is r is the locus of all points satisfying the condition of being in the same plane and at a distance r from a fixed point O in that plane. In space the locus is the surface of a sphere of centre O and radius r. Instead of speaking of the locus of "all points," we may also speak of the locus of "a point" satisfying a given condition. Thus, the locus of a point in a plane at a distance d from the circumference of a circle of radius r is a pair of concentric circles of radii $r + d$ and $r - d$. In proving a theorem concerning the locus of points it is necessary and sufficient to prove two things—that any point on the supposed locus satisfies the given condition, and that any point not on the supposed locus does not satisfy the condition. A few important propositions of loci are: (1) the locus of points equidistant from two given points is the perpendicular bisector of the line joining them; (2) the locus of points equidistant from two given lines consists of the bisectors of their included angles; (3) the locus of points equidistant from three given points is the perpendicular to their plane passing through the centre of the circle on which they lie; (4) the locus of points the sum of whose distances from two fixed points is constant is an ellipse whose foci are the given points; (5) the locus of the vertices of constant angles subtended by a given line segment is an arc of which that segment is the chord; (6) if a pair of variable quantities, x, y, are connected by an equation, and each pair of values is represented by a point in a plane, these points will be on a definite curve called the locus or graph of the equation. (See Coördinates.) Thus, the study of curves by analytic methods is a development of the theory of loci. (See Curve.) The method of loci in pure geometry was extensively used by the Greek geometers, particularly Apollonius, Hippias, Eudoxus, Nicomedes, and Diocles. The methods of Apollonius were restored by Robert Simson in his *De Locis Planis* (1748), but as an analytic instrument the theory of loci dates from Descartes (1637).

LO'CUS DELIC'TI (Lat., place of crime or wrong). In criminal law, the place where a crime is actually committed. The question of *locus delicti* usually arises when a wrongful act is commenced in one jurisdiction and continued in another. For example, if goods are stolen in New Jersey and carried by the thief into Delaware, the larceny was committed in New Jersey, as the wrongful taking with intent to steal constitutes the crime. A State may make it a distinct statutory crime knowingly to bring stolen goods into the State; but in the absence of such a statute such a criminal could not be punished, except in the State where he originally stole the goods. However, if a man stands in New Jersey and shoots another across the line in New York, he is guilty of murder in the latter State, as the killing was in fact committed there, although the criminal act was initiated in New Jersey.

The phrase is also used in the law of torts, but is not of as great importance as in criminal law, as jurisdiction of civil causes merely depends, not on the place where the act was committed, but on jurisdiction over the parties. See Crime; Jurisdiction.

LO'CUS PŒ'NITEN'TIÆ (Lat., place of repentance). In the civil law, the period of time within which a person may retract an offer or withdraw from a contemplated bargain or contract. See Contract.

LO'CUST (from Lat. *locusta*, locust, lobster). Any orthopterous insect of the family Acridiidæ. Much confusion has arisen in the use of this term, for two reasons: the family Locustidæ, including the typical genus *Locusta*, are popularly termed "long-horned grasshoppers"; and, on the other hand, "locust" is given popularly (in the Orthoptera) only to members of the Acridiidæ, which are also termed "short-horned grasshoppers." (See Grasshopper.) In the United States a further confusion arises from the fact that the term "locust" is applied to any member of the hemipterous family Cicadidæ, which includes the so-called seventeen-year "locust" or periodical cicada (see Cicada and Hemiptera) and the common dog-day harvest fly. The name, however, should be restricted to the insects of the family Acridiidæ and is so used by all English-speaking people except in portions of the United States.

Locusts may be distinguished from the long-horned grasshoppers and the crickets, such as the common *Anabrus simplex*, by the relatively short antennæ, the short ovipositor of the female, and the long hind legs with thickened thighs. They stridulate by the friction of the rough hind legs against the wing covers, this method differing from the stridulation of the katydids and crickets. (See Katydid; Cricket.) The wing covers are leathery and narrow, the wings themselves being broad, and when at rest folded like a fan.

The power of flight in locusts varies with the species. Those capable of sustaining prolonged flight have large tracheal dilatations within the body. The species of greatest economic importance in the United States are the Rocky Mountain locust (*Melanoplus spretus*), the red-legged locust (*Melanoplus femur-rubrum*), the lesser migratory locust (*Melanoplus atlantis*), the American locust (*Schistocerca americana*), and the differential locust (*Melanoplus differentialis*). The Old World migratory locusts belong principally to two species, *Pachytylus migratorius* and *Acridium peregrinum*. A South American species of the genus *Acridium* frequently inflicts great damage upon crops in Argentina and Chile, while in South Africa a migratory locust comes down from the north in swarms and destroys the crops of the settlers. These few species, possessing great powers of multiplication and extended powers of flight, have been classed among the world's historical scourges. Early incursions in Europe and north Africa are mentioned by Orosius and St. Augustine, the latter recording a plague in Numidia which resulted in the death of 800,000 men. Pliny states that locusts came over in great swarms from Africa to Italy in his time. Incursions as far north as Germany occurred in 1333 lasting until 1336, 1475, 1527, 1543, 1636, 1686, and at intervals until 1856–59.

The Rocky Mountain locust of the United States formerly bred over vast areas in the Northwest and at intervals migrated in immense swarms for hundreds of miles beyond its usual habitat. In 1818 and 1819 that part of the country now known as Minnesota was covered by vast swarms; in 1820 the western part of Missouri was ravaged; in 1842 they again appeared in Minnesota and Wyoming, and in 1845 in Texas and again in 1849. They appeared in Utah nearly every year from 1851 to 1877, and a portion of Utah at one time was included in the permanent breeding grounds of this species. An unusual locust year was 1856, when the insects swarmed over Kansas and Nebraska, the western counties of Missouri and northeastern Texas, and in Iowa, Minnesota, Colorado, and Utah. In 1870 to 1871 they again began to increase, and in 1873 were very injurious. The most disastrous locust year known in the United States, however, was 1874, when enormous swarms invaded the settled portions of the Mississippi valley west of the ninety-fourth meridian. Colorado, Nebraska, Kansas, Wyoming, Dakota, Minnesota, Iowa, Missouri, New Mexico, Indian Territory, and Texas were overrun by swarms from the Northwest, mainly from Montana and British America. The loss in this region was estimated at $50,000,000 in the actual destruction of crops. In 1875 the young insects hatched in immense numbers over an area embracing portions of Nebraska, Kansas, and Missouri, entailing destitution and suffering among a population of 750,000 people. In 1877 the young insects died in great numbers, and those which acquired wings flew towards the Northwest in the direction of Dakota and Montana, the region of the permanent breeding grounds. The district in which the insect was considered to breed permanently was mapped by the United States Entomological Commission in 1877. It was stated that the area comprised about 300,000 square miles. The most favorite breeding places in this area were the river bottoms and the sunny slopes of uplands or the grassy regions among the mountains. At the same time a "subpermanent" breeding region in which the insects breed more or less continuously was also mapped out. When the Entomological Commission finished its labors in 1879, these conclusions were practically confirmed. Since that time, however, much of that region has been greatly changed in character by settlement and by the introduction of agriculture. The result has been that the permanent breeding grounds of the Rocky Mountain locust have been greatly restricted, and in fact it has practically been driven beyond the borders of the United States, and now breeds freely only in portions of British Columbia. From those grounds, however, occasional swarms fly south into the Northwestern States and do more or less damage for a single season, as has been the case in restricted localities in Minnesota and North Dakota.

The eggs of locusts are usually laid in the ground. With the Rocky Mountain species from 20 to 35 are laid together in a compact mass covered with a pod. The locust itself occupies seven weeks from the time of hatching in attaining its full growth. The locusts of the Old World have been known to fly to Central Europe from their permanent breeding grounds in Central Asia. In North America they often extend their flights over a distance of from 1000 to 2000 miles, or from Montana to Missouri and even to Texas. Flight takes place during the day and ends towards sundown. The rate of travel varies from three to 20 miles an hour, depending upon the wind. The height at which the migrating swarms move differs greatly, according to the direction and height of the air currents. They have been noticed, e.g., flying far above the summit of Parry's Peak, an elevation of more than 13,000 feet.

The best measures advised for their destruction are harrowing and late fall plowing for the destruction of the eggs, crushing of the newly hatched individuals between rollers, and especially the collecting of the young individuals by an apparatus consisting primarily of a coal-oil pan either dragged along the ground or mounted upon wheels. Of late years a good remedy has been discovered in the use of a mash of bran and arsenic, which is distributed in little moist masses about the infested fields. The locusts are fond of this mixture, and it is fatal to them. Good results have been reached in South Africa, and to a much lesser degree in the United States, during the past few years, by distributing a pathogenic fungus of the genus *Sporotrichum*, which kills the locusts when they occur in swarms. Locusts are also subject to several other diseases; there is a fungus of the genus *Mucor* which undoubtedly kills them, and another (*Empusa grylli*) frequently destroys them in great numbers. They have many natural enemies among birds and parasitic insects, including hairworms (see HAIRWORM), and insects that devour their eggs. Locusts are eaten in many countries, roasted or fried in butter. They are also preserved in brine or dried in the sun. They thus appear in the markets of Arabia, Syria, Egypt, and Madagascar, and are even exported as an article of commerce. They are also candied and eaten as a delicacy in China, and in the Philippines they frequently form an important article of diet among the poorer classes.

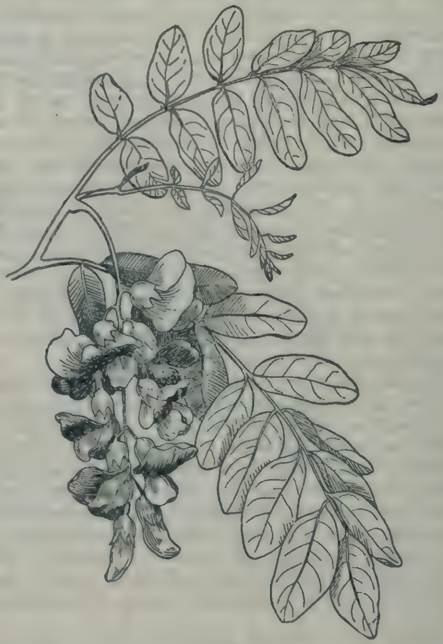
Consult: *United States Entomological Commission, Reports First, Second, and Third* (Washington, 1877, 1879, and 1882); Munro, *The Locust Plague and its Suppression* (London, 1900); also publications of the United States Department of Agriculture, Bureau of Entomology.

LOCUS′TA, or **LUCUS′TA**. A female poisoner at Rome, used by Agrippina to poison Claudius and by Nero to destroy Britannicus. For the latter deed she was rewarded by Nero, but was executed under the Emperor Galba. Consult Juvenal, i, 71, and the editors there.

LOCUST BIRD. A bird notable for feeding upon locusts, especially a South African grackle (*Creatophora carunculata*). In the same region a white stork is called "great" locust bird, and one of the pratincoles (*Glareola nordmanni*, or *melanoptera*) "little" locust bird. The great swarms of locusts that frequently visit the South African plains are followed and attacked by the pratincoles in revolving flocks; their very curious actions are described at length by Layard, in *Birds of South Africa* (London, 1867). In India the name is suitably given to a starling, the familiar rose-colored pastor. See PASTOR.

LOCUST BORER. See CERAMBYCIDÆ.

LOCUST TREE. A name given to various trees of the family Leguminosæ. The carob tree (*Ceratonia siliqua*) is often so called in the countries bordering on the Mediterranean. The locust tree of America (*Robinia pseudacacia*), also called the false acacia or thorn acacia, and on the continent of Europe very generally the acacia, is valuable. It is of rapid growth and is very ornamental, especially when in flower. On account of its rapid growth, spiny branches, and ability to withstand trimming, it is considered a valuable hedge tree. Its generic name is derived from John Robin, who is said to have introduced the tree into France about the year 1600. It succeeds well as a forest tree in Europe except in the north, where it suffers from frost. Locust wood is compact, hard, takes a good polish, and is useful for all purposes in which great strength and especially toughness are required, qualities which make it valuable in shipbuilding, for which large quantities are used. It is also valuable for making the cogs of wheels. In the United States the *Robinia* attains its best development in Kentucky, Tennessee, and vicinity, where in rich soil it reaches 70 to 80 feet and 3 feet in diameter. The tree is especially subject to insect injuries, on which account it is often condemned. The clammy locust, *Robinia viscosa*, and the bristly locust, or rose acacia, *Robinia hispida*, American species, are planted extensively, especially the latter, which is a shrub 3 to 10 feet high. The honey-locust tree of America is a *Gleditschia*. The locust tree of the West Indies (*Hymenæa courbaril*) is a gigantic tree, whose pods supply a mealy nutritious substance in which the seeds are embedded. It is sweet and pleasant, but reputed as inducing diarrhœa when recently gathered. A fermented decoction is used as beer. See CAROB; HONEY LOCUST; and Plate accompanying LIME TREE.



LOCUST.

LOCUST-TREE INSECTS. The insects that attack the locust (*Robinia pseudacacia*) are numerous, and the tree suffers from some of them very seriously in certain parts of the United States. Forty-one species of insects feeding upon this tree are treated in Packard's *Report on Forest Insects*. Of those which affect the trunk, the locust borer, the larva of a long-horned beetle (*Cyllene robiniæ*), is one of the most important. It is a black beetle with yellow transverse bands, and, like its near relative (*Cyllene pictus*) which infests the hickory, has a superficial resemblance to certain wasps and has thus been cited as a case of protective mimicry. Another borer, the larva of a sesiid moth (*Sciapteron robiniæ*), is destructive to locust trees as well as to poplars on the Pacific coast; and the locust twig borer (*Ecdytolopha insiti-*

ciana) causes a thickened growth of certain twigs for a distance of from 1 to 3 inches. The adult of this species is a tortricine moth. (See LEAF ROLLER.) Many of the leaf feeders are leaf rollers and leaf miners, but the larva of a very striking butterfly known as the "locust skipper" (*Eudamus tityrus*) has this habit also. A leaf-mining beetle (*Odontota scutellaris*) disfigures the leaves with its larval mines throughout the Eastern States. The larva of the locust saw fly (*Nematus similaris*) feeds upon the leaves and occasionally defoliates trees. Consult A. S. Packard, *Fifth Report of the United States Entomological Commission* (Washington, 1890).

LO′CY, WILLIAM ALBERT (1857–). An American zoölogist. He was born at Troy, Mich., graduated from the University of Michigan in 1881, and studied also at Harvard (1884–85), Berlin (1891), and Chicago (Ph.D., 1895). He was professor of biology (1887–89) and of animal morphology (1889–96) at Lake Forest University, professor of physiology at Rush Medical College, Chicago (1891), and professor of zoölogy at Northwestern University after 1896. He became known especially for his researches in embryology and animal morphology. In 1902–03 he made investigations at the Naples zoölogical Station. He is author of *Biology and its Makers* (1908).

LODE (AS. *lād*, way, course, from *līpan*, Goth. *leipan*, OHG. *līdan*, to go, to travel). A miners' term for veins in which minerals occur. They are crevices, more or less vertical, produced by contraction or mechanical disturbance of the rock, which have subsequently been filled with metallic ores. See ORE DEPOSITS; MINING; COMSTOCK LODE.

LO-DE′BAR. A place in Gilead which (if the reading be correct) was the residence of Machir, son of Ammiel, with whom Jonathan's son, Mephibosheth, lived at the beginning of David's reign (2 Sam. ix. 4–5). Machir and Lo-debar are mentioned again in chap. xvii. 27 in connection with David's flight in consequence of Absalom's rebellion. Probably the same place is meant in Josh. xiii. 26 (cf. Revised Version, margin), and some authorities think it is referred to in Amos vi. 13. The location has not been identified. A village, Idbar, 7 miles east of Umm Kais (Gadara), has been suggested.

LODEMAN, lō′de-mȧn, ERNEST GUSTAVUS (1867–96). An American horticulturist and author. He was born in Neuchâtel, Switzerland, but came to America with his parents in 1870, his father having been appointed professor of modern languages in the Michigan State Normal School. He was graduated from the Agricultural College of Michigan in 1889. In 1890 he became assistant to Prof. L. H. Bailey in Cornell University and shortly afterward instructor in that institution. While there he originated the spray calendar, a placard which gives in concise form approximate dates for spraying insect and fungous enemies of various crops, together with formulæ for preparing the principal fungicides and insecticides. He also published the results of many investigations in bulletins of the Cornell Agricultural Experiment Station. *The Spraying of Plants* (New York, 1896), his only book, was prepared after comprehensive field work, and embraces not only the results of his exhaustive studies at home and abroad, but all that was then considered valuable on the subject.

LO′DER'S GAZELLE. See GAZELLE.

LODE′STAR, LOADSTAR (*lode*, AS. *lād*, way, course + *star*), LEADING STAR, or GUIDING STAR. Terms applied to the polestar, which is the last star in the tail of the Little Bear. It is a star of the second magnitude, located about 1° 20′ from the North Pole.

LODE′STONE, or **LOADSTONE.** See MAGNETITE.

LODÈVE, lō′dĕv′. The capital of an arrondissement in the Department of Hérault, France, situated in a beautiful valley on the Ergue, 36 miles northwest of Montpellier by rail (Map: France, S., H 5). It retains its mediæval walls, has a fortified cathedral dating from the thirteenth century and a communal college. It is noted for its manufactures of army clothing and woolens, also chemicals. Lodève is the Gallic Luteva and the Roman Forum Neronis. Previous to 1790 it was the seat of a bishop. Cardinal Fleury was a native of Lodève. Pop., 1911, 6315.

LODGE, EDMUND (1756–1839). An English biographer and historian, born in London. He held various heraldic positions, and his studies in that field include: *Illustrations of British History, Biography, and Manners in the Reigns of Henry VIII, Edward VI, Mary, Elizabeth, and James I* (1791), a selection from contemporary manuscripts in the College of Arms; *Portraits of Illustrious Personages of Great Britain* (1814), a work costing more than £40,000; and *The Genealogy of the Existing British Peerage* (1832; last ed., 1859). The present *Lodge's Peerage* grew from an *Annual Peerage and Baronetage* (4 vols., 1827–29), reissued in 1832 as the *Peerage of the British Empire*, the work of the Misses Anne, Eliza, and Maria Innes, to whom Lodge lent the use of his name.

LODGE, GONZALES (1863–). An American classicist, born at Fort Littleton, Pa. He received the bachelor's degree from Johns Hopkins in 1883 and his doctorate from the same university in 1886. From 1889 to 1900 he was professor of Latin in Bryn Mawr, and he then became professor of Greek and Latin in Teachers College, Columbia University. He was joint author of the revised edition of the Gildersleeve-Lodge *Latin Grammar* (1894), editor of Plato's *Gorgias* (1891), and managing editor of the Gildersleeve-Lodge *Latin Series*. Between 1901 and 1914 seven parts had appeared of his great *Lexicon to Plautus*, in which every word is treated with minutest reference to all the variant manuscript readings in the passages in which it occurs, with frequent references also to articles and books in which the words have been discussed. In 1907 he published *The Vocabulary of High School Latin*, a study of the words, approximately 2000 in number, of most frequent occurrence in the Latin usually read in preparation for college, and so of greatest value to students. From 1907 to 1913 he was editor in chief of *The Classical Weekly*.

LODGE, HENRY CABOT (1850–). An American legislator and historical writer, born in Boston, May 12, 1850. He graduated from Harvard College in 1871 and from Harvard Law School in 1874, and two years later, after graduate work in history, received the degree of Ph.D. From 1873 to 1876 he edited the *North American Review*, for three years he lectured on American history at Harvard, and from 1879 to 1881 he was editor of the *International Review*. About this time he entered political life.

He served in the Massachusetts House of Representatives (1880–81), as a Member of Congress (1886–93), and thereafter as United States Senator, being reëlected in 1899, 1905, and 1911. As a politician, he early became prominent for his insistence upon laws to safeguard the franchise and upon the necessity for the restriction of immigration by the requirement of educational qualifications. During the Spanish-American War he strongly supported the administration. A Republican of conservative type, he was a delegate to a number of the party's national conventions and was permanent chairman in 1900 and 1908. In 1903 he was appointed to the Alaskan Boundary Commission and in 1907 to the United States Immigration Commission. With his son-in-law, Representative A. P. Gardner, he led the movement in Congress (1914–15) for an investigation of the military preparedness of the United States. His writings brought him membership in the American Academy of Arts and Letters. These include: *Short History of the English Colonies in America* (1881); *Studies in History* (1884); *History of Boston* (1891); *Historical and Political Essays* (1892); *Speeches* (1895); *Hero Tales from American History* (1895), with Theodore Roosevelt; *Certain Accepted Heroes and Other Essays* (1897); *The Story of the Revolution* (2 vols., 1898); *The War with Spain* (1899); *A Frontier Town and Other Essays* (1906); *Speeches and Addresses* (1910); *One Hundred Years of Peace* (1913); *The Democracy of the Constitution* (1914). He also published the *Life and Letters of George Cabot* (1877) and a volume of *Essays on Anglo-Saxon Land Laws*, and edited the works of Alexander Hamilton (1885). For the "American Statesmen Series" he prepared the lives of Hamilton (1882), Webster (1883), and Washington (2 vols., 1889). His *Early Memories* (1913) is, so far as it goes, autobiographical, and interesting in its personalia regarding New England notables of a generation earlier than the author's. See SUPPLEMENT.

LODGE, SIR OLIVER (JOSEPH) (1851–). An English physicist, philosopher, and student of psychical phenomena. He was born June 12, 1851, at Penkhull, Staffordshire. Upon the completion of his grammar-school education he at first entered business life, but by studying evenings he was able to matriculate and pursue courses at University College, London, where he graduated B.Sc., taking honors in physics, and where, after further study in Prof. Carey Foster's laboratory, he received the degree of D.Sc. and became assistant professor of physics. When University College, Liverpool, was founded, Lodge became professor of physics (1881) and was connected with that institution until 1900, when he became principal of the University of Birmingham. In 1903 he was Romanes lecturer at Oxford. Professor Lodge's researches in electricity dealt especially with alternating currents, lightning discharges, and the physics of the ether. In the course of his experiments with lightning conductors he was able to discover oscillations and waves in conductors. Studying the high-frequency oscillations of a Leyden jar, he was able to create stationary electrical oscillations on wire, and, as he was seeking to demonstrate Maxwell's theoretical observations, it is more than probable that he would have observed these waves in air if he had not been anticipated by Hertz (q.v.). However, in 1894 he discovered that these waves would cause filings of metals to cohere or alter their arrangement and electrical resistance, and was thus able to construct the *coherer*, which plays so important a part in wireless telegraphy (q.v.). This invention was also made independently by Edouard Branly, of Paris; but Lodge's work in this field was followed by other discoveries which brought about substantial advances in wireless telegraphy. His researches on lightning led to the revision of many ideas which had long been held on this subject, and his work on *Lightning Conductors and Lightning Guards* is considered one of the most valuable works of its kind. In addition to his activities in physical science, Sir Oliver interested himself in various educational reforms and in later years took part in philosophical and religious discussion and investigation. He wrote considerably on the relation of modern views of science to religion and became interested in psychical research. At various times he stated publicly his belief in a life after death, and his expectation that eventually unhampered communion would be possible between living persons and the spirits of the dead. From 1901 to 1904 he was president of the Society for Psychical Research. He received the Rumford medal of the Royal Society in 1898, in 1902 was knighted, was president of the Physical Society of London in 1899–1900, and president of the British Association in 1913–14; and he received honorary degrees from Oxford, Cambridge, Victoria, Liverpool, St. Andrews, Glasgow, and Aberdeen. His writings include: *Elementary Mechanics* (1877); *Modern Views of Electricity* (1889 and later eds.); *Lightning Conductors and Lightning Guards* (1892); *Pioneers of Science* (1893); *The Work of Hertz and Some of his Successors* (1894); *Modern Views on Matter* (1903); *Life and Matter* (1905); *The Substance of Faith* (1907); *Man and the Universe* (1908); *Immortality of the Soul* (1908); *Ether of Space* (1909); *The Survival of Man* (1909); *Parent and Child* (1910); *Modern Problems* (1912); *Continuity* (1914).

LODGE, THOMAS (c.1558–1625). An English poet, dramatist, and miscellaneous writer, born in or near London. He graduated B.A. from Trinity College, Oxford (1577); was admitted as law student at Lincoln's Inn (1578); after some experience in the army, made voyages to the Canaries (1588) and to South America (1591); studied medicine, it is said, at Avignon (1600), and received the Oxford M.D. (1602). He died in Old Fish Street, London. His chief writings comprise: *A Defence of Plays* (?1580), a sharp retort to Stephen Gosson's *School of Abuse; An Alarum against Usurers* (1584); two plays, *The Wounds of Civil War* (1594) and, in conjunction with Robert Greene, *A Looking Glass for London and England* (1594); several romances, among which are *Rosalynde* (1590) and *Life of William Longbeard* (1593); translations of Josephus (1602) and of Seneca (1614); *Glaucus and Scilla* (1589, in a volume entitled *Scillaes Metamorphosis*), probably the model of Shakespeare's *Venus and Adonis; A Fig for Momus* (1595), a collection of satires, epistles, and eclogues; and a choice volume of poems called *Phillis* (1593). Lodge was one of the most graceful lyricists of the Elizabethan period. His *Rosalynde*, a beautiful pastoral, interspersed with some of his best verse, was the basis of Shakespeare's *As You Like It*. Consult: *Works*, all but translations, edited by E. W.

Gosse for the Hunterian Club, Glasgow (4 vols., 1878–82); J. A. A. Jusserand, *English Novel in the Time of Shakespeare*, translated from the French by Elizabeth Lee (Paris, 1890); J. A. Symonds, *Shakespere's Predecessors in the English Drama* (new ed., London, 1900); G. E. B. Saintsbury, *History of Elizabethan Literature* (ib., 1906).

LODGED (from *lodge*, OF., Fr. *loger*, to house, from *loge*, lodge, from ML. *lobia, lobium, laubia*, portico; ultimately connected with Eng. *lobby*). In heraldry, a term applied to a beast of chase, as a stag, when lying down with its head erect. A beast of prey in the same position is said to be couchant. See HERALDRY.

LODGING HOUSES. Houses which provide shelter for homeless people. The rapid and continuous increase of the floating population in large cities, due to the steady drift of low-grade labor to the cities, has accentuated the problem of lodging houses as distinguished from the tenement problem. This undomiciled population is a fruitful cause of disorder. At first America attempted to solve the problem by allowing the homeless to find shelter in the police stations. The buildings were ill adapted for the purpose, decent sanitary conditions usually impossible, and the general situation so demoralizing to the self-respecting laborer that the practice is now forbidden in most cities. Various rescue missions have conducted houses, often furnishing a free breakfast in addition to the night's lodging. In all the large cities there are many places where lodging and breakfast can be had for a pittance; but these places are run for gain, and conditions are often very bad. New York has some 105 such houses, with beds for 16,000.

There is a general sentiment that decent accommodations should be furnished the homeless, and in most cities efforts are being made to substitute sanitary houses for the filthy accommodations now so common. The most striking examples in the United States of model lodging houses are the two Mills hotels, in lower New York City, established by the late D. O. Mills. They accommodate 2250 men. Each lodger has a private room at a cost of 20 or 40 cents per night, with the privilege of free baths and use of laundry. Large, well-equipped reading, writing, and game rooms are provided. The enterprise has paid a fair return on the capital invested.

Boston, New York, Chicago, and other cities have established municipal lodging houses, where those who cannot pay for shelter may obtain lodging and breakfast in return for a few hours of labor, usually sawing and splitting wood. An agent investigates the stories of the men and assists in securing regular employment. No one may remain more than two or three nights consecutively without a good reason. In several cities, as Philadelphia and New York, similar institutions are maintained by charity organization societies, Salvation Army, etc. In some of the Salvation Army shelters a charge of 10 cents is made for lodging in a dormitory, and 15 cents for a separate room, bread and coffee being furnished for breakfast.

Most of the British municipalities have lodging houses. On the Continent Paris conducts seven establishments (*refuges de nuit*), three for men and four for women, which combine workshops with shelter. In the principal shelter for men, the Asile Nicolas Flamel, simple employment is given in a connected workshop with wages from two to three francs daily. These are accumulated until the worker leaves the establishment. Endeavors are made to secure employment outside. In Germany there are many private institutions, often carrying on some simple manufacture (brooms, etc.), at which homeless men and women may find shelter and a chance to work. The Christliche Hospize in the larger cities provide comfortable shelter at very low cost to working men. Berlin conducts a municipal night shelter where any penniless person may be received on five successive days five times in the course of three months. Soup and bread are provided at night and morning. See HOUSING PROBLEM.

Consult: *Charities Review*, vol. i (New York); "Floating Populations," *Annals of the American Academy of Social and Political Science*, vol. x; Jacob Riis, *The Children of the Poor* (New York, 1902); *Schlafstellenwesen und Ledigheime* (Berlin, 1904); Raymond Robins, *What Constitutes a Municipal Lodging House* (New York, 1904); W. H. Dawson, *The German Workman* (London, 1906).

LODGINGS. Furnished rooms or apartments which are let by special agreement, and in which the lodger gets no property right or interest, but merely the privilege of use and occupation under the terms of his contract. The relation of landlord and tenant does not exist between a keeper of lodgings and a lodger. One of the important distinctions is that a lodger has merely a personal action for damages for breach of contract against the proprietor of the lodgings in case the latter evicts him contrary to their agreement; whereas a tenant can enforce his property rights by an action to recover the actual possession of the premises if he is wrongfully evicted by his landlord or any other person. Unless particular rooms or apartments are specially designated in the agreement between the proprietor and a lodger, the latter may be assigned or changed to any room in the same house of the general character and class as that for which he bargained. The proprietor of lodgings is not, like an innkeeper, obliged to receive every person who applies to him, but may select his lodgers as he sees fit, and make such terms as may be satisfactory to both parties; nor is he absolutely responsible for the baggage and effects of his lodgers, but is liable only for loss resulting from his negligence or that of his servants. In the absence of statute he has no lien on the property of the lodgers in his house for the amount due him, but in New York and several other jurisdictions, lodging-house and boarding-house keepers possess such a lien. The keeper of a lodging house has the legal possession, care, and custody of his whole house and of every room; and it has been held that a lodger is not entitled to maintain an action against a stranger who invades his room, as that right is in the proprietor. A lodging house proper differs from a boarding house in that no meals are furnished to the lodgers as such. Boarders are, however, usually lodgers also, and therefore the term "boarder" is popularly employed to designate one who is entitled to meals and lodgings at the same house. See BOARDING HOUSE; INN; INNKEEPER; LANDLORD AND TENANT; LIEN; and consult the authorities referred to under CONTRACT; BAILMENT; ETC.

LODI, lō′dē. An episcopal city in the Province of Milan, Italy, 20 miles southeast of the city of Milan, on the Adda (Map: Italy, B 2).

It has a cathedral erected in 1158, containing numerous sculptures, and the fine fifteenth-century church of the Incoronata, an edifice in the Renaissance style and adorned with valuable paintings by the Piazza family and four altar pieces by Calisto Piazza. Its schools include a Gymnasium, a seminary, a technical school, and a teachers' institute, and there are a library and a lyceum. The district is one of the most extensive cheese-producing centres in the world; the manufactures include linen and woolen goods, silk, cement, pottery, and leather. Here, on the 10th of May, 1796, Napoleon won his celebrated victory over the Austrians which gained for France the possession of Lombardy. The ruins of the old Roman colony of Lodi Vecchio lie 4 miles west. Pop. (commune), 1901, 27,811; 1911, 28,032.

LODI. A city in San Joaquin Co., Cal., about 35 miles south of Sacramento, on the Mokelumne River, and on the Southern Pacific and the Central California Traction Company railroads (Map: California, D 4). Features of interest are the Union High School, a Carnegie library, and the municipal building. Lodi is situated in a rich fruit country, its chief industrial establishments being fruit-packing sheds, fruit-juice factories, and a cream-of-tartar factory. The electric-light plant and water works are owned and operated by the municipality. Pop., 1910, 2697.

LODI. A borough in Bergen Co., N. J., 2 miles (direct) northeast of Passaic, on Saddle River, and on the New York, Susquehanna, and Western Railroad (Map: New Jersey, D 2). The dyeing of silk and cotton goods is the principal industry, and there are also bleaching works and manufactures of rubber goods and plantation car equipments. The water works are owned by the borough. Pop., 1900, 1917; 1910, 4138.

LOD'OME'RIA. The Latin name of a mediæval Slavic principality, whose history forms part of that of Galicia (in Austria-Hungary). See Galicia.

LODZ, lôdz; *Polish pron.* lụj. The capital of the district of Lodz, in the government of Piotrkow, and next to Warsaw the most important town in Russian Poland. It is situated on the Ludka, 87 miles by rail southwest of Warsaw, and occupies with its suburbs an area of nearly 11 square miles (Map: Russia, A 4). It is primarily a manufacturing city, devoid of any architectural beauty. It is well supplied with educational institutions, which include two Gymnasia, a technical institute, three theatres, and several libraries. In the manufacturing of textiles Lodz holds the foremost position in Russian Poland. The industry is of comparatively recent origin, the first textile mills having been founded there in 1815. There are at Lodz upward of 650 establishments, having an annual output valued at $75,000,000. Cotton goods and woolens are the principal products, but there are also manufactured linen, silk goods, machinery, boilers, chemicals, beer, etc. The textile industry is chiefly in the hands of the Germans, to whom the city is mainly indebted for its present position. In 1860 Lodz had only 32,600 inhabitants; in 1885, 113,413; and in 1912, 450,604. The majority of the inhabitants are Poles, Germans, or descendants of Germans, and Jews. Lodz was occupied by the Germans in the early part of the European War which started in 1914, but they were compelled to evacuate the city by a superior Russian army. A month later it was retaken by the Germans after a destructive bombardment. They immediately strongly fortified it and used it as a base for later drives on Warsaw. See War in Europe.

LOEB, lẽb, Jacques (1859–). An American physiologist and experimental biologist. Born in Germany, he graduated from the Ascanisches Gymnasium in Berlin, and studied medicine at Berlin, Munich, and Strassburg, receiving the degree of M.D. at Strassburg in 1884. Between 1886 and 1891 he was assistant in physiology at the universities of Würzburg and Strassburg, and a research student at the Naples Zoölogical Station. He then came to the United States and was associate professor of biology at Bryn Mawr College (1891–92); assistant, associate, and full professor of physiology and experimental biology at the University of Chicago (1892–1902); professor of physiology at the University of California (1902–10); and thereafter head of the Department of Experimental Biology at the Rockefeller Institute, New York. He received an honorary D.Sc. from Cambridge University, M.D. from Geneva, and Ph.D. from Leipzig, all in 1909. Professor Loeb's special field is comparative physiology and psychology. He did pioneer work on artificial parthenogenesis and in an analysis of the process of fertilization of the egg. Among his important papers and books are: *The Heliotropism of Animals and its Identity with the Heliotropism of Plants* (1890); *Physiological Morphology* (vol. i, 1891; vol. ii, 1892); *Comparative Physiology of the Brain and Comparative Psychology* (1900); *Studies in General Physiology* (2 vols., 1905); *Dynamics of Living Matter* (1906); *Mechanistic Conception of Life* (1912); *Artificial Parthenogenesis and Fertilization* (1913); and numerous papers on physiology and experimental biology.

LOEB, James (1867–). An American banker, born in New York City. In 1888 he graduated from Harvard University and from then until 1901, when he retired, he was a member of the banking firm of Kuhn, Loeb & Co. He became a member of the English Society for the Promotion of Hellenic Studies. His extensive collection of Aretine pottery was placed in the Fogg Museum at Harvard. In 1911 plans were matured for the publication of the Loeb Classical Library, a library of some 300 volumes of translations from Greek and Latin authors, with the help of funds supplied by Mr. Loeb. For these plans, consult the article "Philology, Classical," in the New International Year Book for 1911; for the progress made by the library, consult id., 1912 et seq.

LOEB, Leo (1869–). An American pathologist, born in Germany. He studied at the universities of Heidelberg, Berlin, Zurich, Basel, and Freiburg, and in 1903 he was a research fellow at McGill University, Canada. He served as adjunct professor of pathology at the University of Illinois in 1900–01, as experimental pathologist of the New York State Pathological Laboratory in 1902, and assistant professor of experimental pathology at the University of Pennsylvania in 1904–10. In the latter year he became director of the pathological department of the Barnard Skin and Cancer Hospital at St. Louis. In 1911 he was president of the Society for Cancer Research and in 1915 president of the American Association of Pathologists and Bacteriologists. He published *The Venom of Heloderma* (1913).

LOEB, Louis (1866–1909). An American figure painter and illustrator, born in Cleveland, Ohio. He was a pupil of Gérôme in Paris and afterward settled in New York City and became an associate of the National Academy of Design and a member of the Society of American Artists in 1900. His subjects are usually landscapes, with figures, treated in an agreeable, decorative manner, with considerable poetic feeling, but with an almost academic completeness which sometimes destroys the personal note. The best known of his works include: "Temple of the Winds" (1898, Metropolitan Museum); "The Breeze" (1900); "The Joyous Life" (1903); "The Dawn" (1903), which won the Webb prize; "The Siren" (1905); portrait of Eleanor Robson (1905); "Miranda" (1906, Metropolitan Museum, New York); "The Summit" (1907); Princess Zomona (1908). He received the second Hallgarten prize of the National Academy of Design (1902) and two silver medals at St. Louis (1904).

LOEB CLASSICAL LIBRARY. See Loeb, James.

LOEBELL, lẽ'bel, Johann Wilhelm (1786–1863). A German historian, born in Berlin and educated at Heidelberg and at Berlin under Wolf and Böckh. From 1814 to 1829 he taught in the military academies at Breslau and Berlin and then became professor of history at Bonn. His best-known work is the revision of Becker's *Weltgeschichte* (1836–38). He also wrote: *Gregor von Tours und seine Zeit* (2d ed., 1869); *Weltgeschichte in Umrissen und Ausführungen*, part i (1846); *Die Entwicklung der deutschen Poesie von Klopstocks ersten Auftreten bis zu Goethes Tode* (1856–65); and an anonymous attack on Ultramontanism, *Historische Briefe* (1861). Consult Bernhardt and Noorden, *Zur Würdigung Loebells* (Brunswick, 1864).

LOEFFLER, lĕf'lẽr, Charles Martin (1861–). An American composer, born at Mühlhausen (Alsace). He received his musical education in Paris and Berlin. On the violin his teachers were Léonard, Massart, and Joachim, in composition Guiraud and Kiel. He began his career as a violinist in Pasdeloup's orchestra. In 1881 he came to America, and when the Boston Symphony Orchestra was founded, in 1883, he was appointed to share the first desk of the violins with the concert master, a position which he filled for 20 years. In 1903 he resigned in order to devote his entire time to composition. As a composer, he is remarkable rather for his mastery of the technical resources than for power of thematic invention or originality. In fact, his works exemplify all the characteristics of the ultramodern French style. His compositions include the symphonic poems, *The Death of Tintagiles, Avant que tu ne t'en ailles, Villanelle du Diable, Pagan Poem;* a suite for violin and orchestra; a *Fantastic Concerto* for cello and orchestra; a *Divertimento* for violin and orchestra; a string quartet; a string sextet; an octet for strings, two clarinets, and harp.

LOEFFLER, Friedrich (1852–1915). A German bacteriologist, born at Frankfort-on-the-Oder. He studied at the universities of Würzburg and Berlin, became assistant in the Imperial Health Office in 1879, and staff physician in Friedrich Wilhelm Institute in Berlin in 1884. In 1888 he was made professor at Greifswald. Loeffler did much to improve the technical methods of bacteriology, especially in the fields of preparation and staining. With Schütz he discovered the bacillus of glanders (1882), and he distinguished from true glanders a form prevalent among swine. In 1884 he described the "Klebs-Loeffler" bacillus of diphtheria, for which he devised a staining process and a special culture medium. With Frosch and Uhlenhutt he investigated the foot-and-mouth disease. Loeffler was a founder (1887) of the *Zentralblatt für Bakteriologie und Parasitik.* Besides contributions to this and other medical journals, and the treatment of malaria (1903) in Leyden and Klemperer's *Deutsche Klinik,* he published *Vorlesungen über die geschichtliche Entwicklung der Lehre von den Bakterien* (1887) and *Die Schutzimpfung gegen die Maul- und Klauenseuche* (1903).

LOENING, lẽ'nĭng, Edgar (1843–). A German legal scholar, brother of Richard Loening, born in Paris and educated at Bonn, Heidelberg, and Leipzig. He was appointed to chairs of law at Strassburg in 1872, at Dorpat in 1877, at Rostock in 1883, and at Halle in 1886. His publications include: *Geschichte des deutschen Kirchenrechts* (1878); *Die Haftung des Staates aus rechtswidrigen Handlungen seiner Beamten* (1879); *Die Befreiung des Bauernstandes in Deutschland und Livland* (1880); *Repräsentativ-Verfassung im neunzehnten Jahrhundert* (1900); *Gerichtsbarkeit über fremde Staaten und Souveräne* (1903); *Autonomie der standesherrlichen Häuser* (1905); *Grundzüge der Verfassung des deutschen Reiches* (1909); *Die Entwicklung des Genossenschaftswesens in Deutschland* (1911); *Kaiser und Reich* (1913). He edited the *Jahrbücher für Nationalökonomie und Statistik* and *Handwörterbuch der Staatswissenschaften.*

LOENING, Richard (1848–1913). A German legal scholar, brother of Edgar Loening, born in Frankfort and educated at the universities of Heidelberg and Berlin. In 1878 he was made professor extraordinarius and in 1882 professor ordinarius at Heidelberg. In the same year he became professor at Jena, which position he held until his death. He wrote: *Der Vertragsbruch im deutschen Recht* (1876); *Der Reinigungseid bei Ungerichtsklagen im deutschen Mittelalter* (1880); *Grundriss zu Vorlesungen über deutsches Strafrecht* (1885); *Die Hamlet-Tragödie Shakespeares* (1893); *Geschichte der strafrechtlichen Zurechnungslehre* (1903); *Ueber Wurzel und Wesen der Rechts* (1907).

LOESS, lẽs (Ger.). A loamy or sandy deposit of Pleistocene age, occurring in many parts of the world. It was first described as occurring in the Rhine valley, but it is now known to cover large areas in central Europe, in the western half of the United States, and in China. Its general character is that of a very fine-grained homogeneous sand, with very little clay, but often calcareous. It lacks usually the bedded arrangement common to most sedimentary deposits but has a vertical fracture which gives a steep slope to the ravines and valleys eroded in the loess. In the United States and China the deposits attain great thickness, 250 feet or more, and where cut into by rivers like the Mississippi or Hoang-ho they form high cliffs. Loess affords a fine fertile soil, especially when charged with organic matter, but, owing to its porous nature, it requires abundant moisture. The famous black soils of southern Russia consist of loess with an abundance of organic matter. The origin of loess has been variously explained. Where the material lies in river valleys, it is undoubtedly due to stream deposition, this having probably occurred in glacial or postglacial times, when the waters contained much fine sediment derived from the melting ice. Where, however, it covers vast areas, a different mode of origin must be sought. Many geologists consider that much of the loess of the Great Plains region was deposited in glacial lakes; Richthofen believes that the loess of China is of æolian origin. The fact that shells of land snails are occasionally found in the American loess leads some geologists to claim a similar origin for at least portions of it. A material resembling loess, called adobe, is found in many valleys of the Far West. It is a calcareous clay, derived from the disintegration of rocks on the valley slopes. The chief economic value of the loess is for brickmaking. When irrigated, it forms an unusually productive soil.

Consult: Chamberlin and Salisbury, "The Driftless Area of the Upper Mississippi Valley," in *Sixth Annual Report of the United States Geological Survey* (Washington, 1885); McGee, "The Pleistocene History of Northeastern Iowa," in *United States Geological Survey, Eleventh Annual Report* (ib., 1891); Sardeson, *American Journal of Science*, vol. vii (4th series, New Haven, 1899).

LOESSING, lẽs′sĭng, Herman. The secular name of José de Jesú María Ignacio (q.v.).

LOEWE, lẽ′ve, Karl (1796–1869). A German composer, born at Löbejün near Halle. He received his musical education at the Francke Institut, Halle, after which he studied under Türk, and in 1814 entered the Singakademie. A few years later he took up the study of theology and during the same period (1817–19) produced the cantatas *Treuröschen, Erlkönig,* and *Wallhaide.* After this he became cantor of St. Jacob's Church, Stettin, and teacher at the Gymnasium (1820). In 1866 he moved to Kiel. Löwe was one of the first to give artistic form to the ballad. He had a sympathetic voice, which, together with an admirable technique and a thorough mastery of dramatic expression, enabled him to make his song compositions popular throughout the world. His compositions include the opera *Die drei Wünsche* (1834), 17 oratorios, most of them in manuscript, and 127 songs and other works. An excellent selection of his ballads has been published by Peters and Schlesinger (Germany) in the well-known two Loewe Albums (20 and 16 songs respectively), in which collection are included "Archibald Douglas," "Tom der Reimer," "Olaf," "Erlkönig," "Heinrich der Vogler." He died at Kiel. Consult: Max Runze, *Carl Loewe* (Leipzig, 1905); Karl Anton, *Beiträge zur Biographie Carl Loewes* (Halle, 1912); Hans Kleemann, *Beiträge zur Aesthetik und Geschichte der Loeweschen Ballade* (ib., 1913).

LOEWE, Wilhelm (1814–86). A German Liberal politician, also called Loewe-Kalbe. He was born at Olvenstedt, near Magdeburg, was educated at Halle, and became a practicing physician in Kalbe. In 1848 he was elected to the Frankfort Parliament, was a prominent member of the extreme Democratic Left, was soon chosen first Vice President of the Parliament, and, after its removal to Stuttgart, was made President. At first acquitted on the charge of sedition for his part in this revolutionary movement, he was finally sentenced *in contumaciam* to life imprisonment. He spent several years in Switzerland, Paris, and London, and then practiced medicine for eight years in New York. In 1861 he benefited by the amnesty and returned to Germany. Two years later he was elected to the Prussian House of Deputies, and in 1867 to the North German Reichstag as a member of the Progressist party. In 1874 he quarreled with his party on the military law of that year and tried to form with other independents a Liberal party which would agree in political matters with the Progressist party, but would be free on economic questions. In carrying out this policy he eagerly defended the protective tariff of 1879. He was defeated for reëlection in 1881. From 1871 to 1875 he was Vice President of the Prussian House of Deputies, declining reëlection in 1876.

LOEWY, lẽ′vẽ′, Maurice (1833–1907). A French astronomer, born in Vienna. He studied astronomy in his native city, but was later called to Paris by Leverrier, who offered him a position in the observatory there. In 1872 he became a member of the Bureau des Longitudes and the next year succeeded Delaunay in the Academy of Sciences. After Leverrier's death he became associated (1878) with Admiral Mouchez in the management of the Paris Observatory, serving as director after 1896. He invented the *equatorial coudé;* and, in addition to editing the *Connaissance des Temps* and the *Annuaire du Bureau des Longitudes,* made frequent contributions to the memoirs of the academies in Paris and Vienna. With Puiseux, he published *Atlas photographique de la lune* (6 vols., 1896–1908).

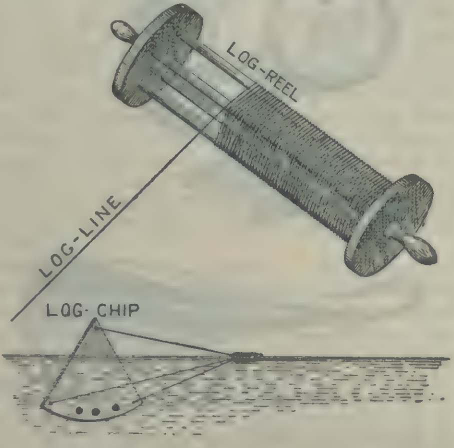
LÖFFTZ, lĕfts, Ludwig (1845–1910). A German genre and landscape painter, born at Darmstadt. He was a pupil of Kreling and Raupp at Nuremberg, then of Diez at the Academy in Munich, where he became professor in 1879, and of which he was director in 1891–99. His chief importance lay in his influence as a teacher. His works, which are not numerous, are treated in the spirit of the Flemish masters, and his religious subjects are imbued with deep and solemn sentiment. Great technical skill and masterly treatment of the chiaroscuro produce the most harmonious effects in all his paintings, which include: "Cardinal Playing the Organ" (1876, exhibited at the Metropolitan Museum, New York, in 1909), a likeness of Franz Liszt; "Avarice and Love" (1879, in the collection of W. H. Vanderbilt, New York), suggestive of Quentin Massys; "Erasmus in his Study" (Stuttgart Museum); "An Old Woman" (Frankfort). The impressive "Pietà" (1883) won for him the gold medal at the International Exhibition in Munich and is now in the New Pinakothek, which also contains "Eurydice" (1898). Gold medals were awarded him also at Antwerp, London, and Vienna. For the cathedral at Freising he painted a large altarpiece, "Assumption of the Virgin" (1889). In his later years he devoted himself also to landscape.

LOFO′TEN, or **LOFO′DEN**. A chain of islands extending about 175 miles in a southwest direction from the northwest coast of Norway, within the Arctic circle (Map: Norway, E 2). It comprises the Lofoten proper and the Vesteraalen Islands, to the north. The archipelago consists of several large islands and innumerable small islets and rocks. The largest islands are Hindö, Langö, Andö, Oest-Vaagö, Vest-Vaagö, and Moske-næsö, of which the first three belong to the Vesteraalen group. Hindö, which lies nearest to the mainland, has an area of 850 square miles. They are extremely irregular in outline, being indented with numerous narrow and winding fiords, and consist of masses of rocks torn asunder to an extraordinary degree, rising abruptly from the deep water in precipices and needle-shaped crags often over 1000 feet high. The mountains culminate in Higrafstind, 3811 feet. The tidal currents in the narrow channels separating the islands are in some places so swift as to make navigation difficult even for steamers. (See MALSTRÖM.) The interior of the islands is mostly barren and uninhabited, though the eastern portions of Hindö are covered with forests, and some of the sheltered valleys support a little agriculture and sheep raising. The climate, while not severe, is raw; the mean temperature is 38.5° F. and the annual rainfall, 43.34 inches. The inhabitants, who number about 40,000, live along the coasts in isolated farmhouses or in small fishing villages. The cod fisheries are the main support of the islands as well as of thousands of fishermen from the mainland who brave these dangerous waters every year from December to March. These fisheries have been famous for centuries; they are an important source of national wealth and are among the richest in the world.

LOFTUS, lŏf′tŭs, AUGUSTUS WILLIAM FREDERICK SPENCER, LORD (1817–1904). An English diplomat, fourth son of the Marquis of Ely, born in Bristol. He was educated by private tutors and at Eton and Cambridge, entered the diplomatic corps in 1837 as attaché at Berlin and later at Stuttgart (1844). In 1848 he was secretary to Sir Stratford Canning on the Radcliffe special mission to the European courts. Four years afterward he became Secretary of Legation at Stuttgart and in 1853 held a like post at Berlin. In 1858 he was Envoy at Vienna, in 1860 at Berlin, and in 1862 at Munich; as Ambassador, he served at Berlin (1866), as agent to the North German Confederation (1868–71), and then at St. Petersburg (1871–79). After six years as Governor of New South Wales Loftus was retired in 1855. He published *The Diplomatic Reminiscences of Lord Augustus Loftus* (2 series, 1892, 1894).

LOFTUS, WILLIAM KENNETT (c.1821–58). An English archæologist, born at Rye in Sussex. He was educated at Cambridge and from 1849 to 1852 made extensive explorations on the sites of the ancient cities on the Tigris and Euphrates. In 1853–55, under the auspices of the Assyrian Excavation Fund, he made particular examination of Nineveh and Babylon, returning with highly valued collections for the British Museum. He published *Travels and Researches in Chaldæa and Susiana* (1857) and contributed to the *Quarterly Journal of the Geological Society* and to the *Journal of the Royal Geographical Society*.

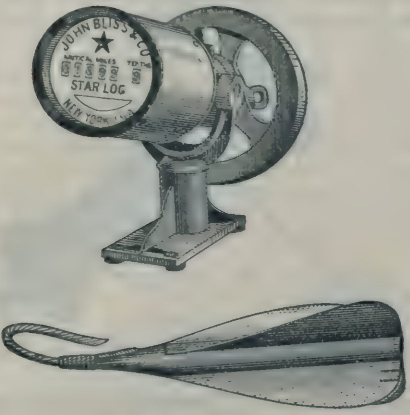
LOG (Swed. *logg*, Dan. *log*, ship's log; ultimately connected with Eng. *log*, felled tree, and with Icel. *liggja*, AS. *licgan*, Eng. *lie*). An apparatus for ascertaining the speed of a ship through the water. Logs are of two kinds, the old-type *chip log* and the *patent* or *taffrail log*. The former consists of the *log chip, log line, reel*, and *time glass* (14-second or 28-second). The *chip* consists of a piece of board about ½ of an inch thick and cut in the shape of a quadrant of a circle of about 6-inch radius. Along its curved edge there is a groove filled with lead to ballast it and assist to keep it vertical, and near each angle there is a hole. In the holes at the ends of the circular arc are passed the ends of a small piece of rope which are knotted on the other side to keep them from pulling through. In the middle of this piece of rope is seized a wooden plug called a toggle. The end of the log line is passed through the other hole in the chip and similarly knotted; on the log line there is secured a piece of wood with a hole or socket in it for the toggle, and its distance from the chip is such that when the toggle is inserted the three lines hold the chip horizontal if the log line is held vertically. The log line consists of a small rope (untarred hemp usually) about ¼ of an inch in diameter and 150 fathoms long, and is wound upon a reel fitted to turn easily upon its axis, which protrudes beyond the reel to form handles by which it is held..



CHIP LOG.

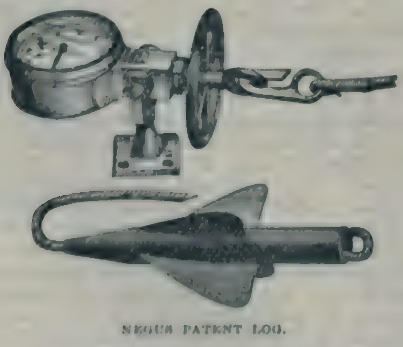
The log line is marked as follows: for a certain distance from the chip, usually about 20 fathoms, there are no marks; this is called the *stray line* and must be long enough to let the chip get well clear of the eddies at the stern of the ship. The end of the stray line is marked with a white rag. From that measure off the length for one knot (about 47 feet, 3 inches for a 28-second glass) and mark it with a piece of cord worked into the lay of the rope and having one knot tied in its end; the second knot is marked with a similar piece of cord (usually hard-twisted fishline) having two knots on it, and so on. Each knot is subdivided and marked at every two-tenths with a small piece of cord without knots.

The time glasses are shaped like the conventional hourglass and filled with a black sand, which should be kept dry and free-running. To heave the log requires at least two persons, preferably three or more if the ship is going over four knots. One man holds the reel and another the glass; after throwing the log chip (the toggle pressed firmly into the socket) over the stern, the man with the glass waits for the white rag at the end of the stray line to pass over the ship's rail; if the reel does not work easily, he assists it by pulling on the line, for no strain must come on the chip, nor must the line lie slack in the water. When the white rag crosses the rail, he turns the glass quickly or directs another man to do so—if there is a third—and when the sand is out the person holding the glass calls "Up!" The line is grasped and held, and the number of knots and tenths which have run out is noted. The pressure of the water against the chip when the line is held causes the toggle to pull out of the socket; the chip then lies flat on the water, and the line is easily drawn in. When the line is properly marked, the glass in good order, and the heaving of the log carefully done, the result should not be in error more than two-tenths of a knot and should average less. But it must be remembered that this method only determines the speed at a particular moment, and this may not be the average speed during the interval for which the speed is desired.



BLISS PATENT LOG.

A *patent* or *taffrail log* is very different in principle as well as in construction. It records the actual distance passed over by the ship and not the speed at any particular time. It consists of a register having three dials or other indicating devices, and appropriate gearing, a rotator which has a small body and blades like a propeller—but of greater proportional surface—and a log line of hard braided untarred hemp connecting them. As the ship goes ahead, the rotator—which is 100 yards astern—tends to twist the log line; this in turn transmits the twisting motion to the register which by suitable gearing records the proper distance. In early types of taffrail logs there was a tendency of the log line to twist until the inertia of the gearing was overcome, and then the latter would buzz around for two or three seconds. In recent types this is avoided by a little flywheel on the shaft to which the line is attached; this makes the motion smooth and regular and adds to the accuracy of the instrument. Some dials have three hands—showing tenths, miles, and tens of miles; some read like a revolution counter; and others like a clock. By reading the log the speed may be ascertained; the reading is usually recorded hourly in the log book (q.v.).



NEGUS PATENT LOG.

The log and line for determining the speed of ships is of comparatively recent origin. Purchas refers to it in 1607, but it was certainly not common before 1620. No record is to be found in any ancient writings of the means used by old navigators to estimate the speed of their ships. Bourne, writing in 1557, describes a design for a machine to record the speed of ships not unlike Massey's submerged log, which latter had the rotator or propeller directly connected to the dial and the whole submerged and secured to a brace or trailing line; it had to be hauled on board to read it, and this was a fatal defect, which soon caused it to be displaced by the taffrail log—indeed, it was never much used. Taffrail logs came into general use about 1875. On large steamers the revolutions of the propeller give a fairly accurate measurement of the distance passed over and of the speed; and if the weather is fair and sea not too rough, the measurement is as accurate as that of any form of log, provided the corresponding speeds for various conditions of draft, trim, etc., have been determined.

In shallow waters when the currents are swift and variable a *ground log* is used. In this case a light lead or other weight is hitched to the log line instead of the chip. This sinks to the bottom, and the speed of the vessel over the ground is ascertained instead of her speed through the water, and some idea of the direction she is making over the ground is also thus obtained. Logs have been designed to show the speed on counters located on the bridge, but they have not been found very satisfactory, and few of them are in use.

LOG. See Log Book.

LO'GAN. A village and the county seat of Hocking Co., Ohio, 50 miles by rail southeast of Columbus, on the Hocking River, and on the Hocking Valley Railroad (Map: Ohio, F 6). It is the centre of an extensive natural-gas and oil field and has foundries and machine shops, flour mills, furniture, sewer-pipe, and shoe factories, a pottery, and fireproof and paving brick plants. Noteworthy features are the public library, Cherrington Hospital, Rock House, Ash Cave, and Rock Bridge. The first settlement was made here in 1802. The village takes its name from Logan, the Indian chief. There are municipal water works. Pop., 1900, 3480; 1910, 4850.

LOGAN. A city and the county seat of Cache Co., Utah, 60 miles by rail north of Ogden, near Logan River, and on the Oregon Short Line Railroad (Map: Utah, C 1). It is the seat of the State Agricultural College, Brigham Young College (Latter Day Saints), opened in 1878, and New Jersey Academy (Presbyterian), and contains fine Federal and courthouse buildings and several beautiful churches. The industrial establishments include saw mills, beet-sugar and condensed-milk factories, and knitting and flour mills. Settled in 1859, Logan was incorporated in 1866 under an act of the Territorial Legislature and has adopted the commission form of government. The city owns and operates the water works and electric-light plant. Pop., 1900, 5451; 1910, 7522.

LOGAN, or LOGGAN. See Rocking Stone.

LOGAN, Benjamin (1752–1802). An American pioneer and Indian fighter. He was born of

Irish parentage in Augusta Co., Va., but at an early age crossed the Alleghanies and settled in Kentucky. There he was associated with Boone, Kenton, and others in almost constant Indian warfare, and took part as a scout in Lord Dunmore's War (q.v.) and in the fighting between the frontiersmen and the British and Indians during the Revolution. In 1775 he built near Stanford, Ky., the stockade known as Logan's Fort, which was besieged by the Indians in 1777, on which occasion he, with one companion, broke through the Indian lines and reached Holston, 150 miles away, where reënforcements were obtained. He took part in Colonel Bowman's expedition against the Shawnees at Chillicothe and commanded the force sent in pursuit of Girty and his Indian allies. It was the precipitate haste of his advance guard that led to the bloody defeat at Blue Licks, Logan himself with the main body arriving on the scene the day after the battle. In 1786 he successfully attacked the Indians after Clark's dash upon the Wabash towns had proved a failure. He was a member of the Kentucky Constitutional Conventions of 1792 and 1799 and served for several terms in the State Legislature.

LOGAN, George (1753–1821). An American scientist and politician, born of Quaker parentage at Stenton (now a part of Philadelphia), Pa. He studied medicine at Edinburgh for three years and then traveled on the Continent, returning to America in 1780. He did not take up the practice of his profession, but devoted himself to literature and public interests and to applying scientific methods in agriculture. Upon the formation of political parties he allied himself with Jefferson and the Republicans against the Federalists. He served several terms in the State Legislature and was a member of the United States Senate from 1801 to 1807. In 1798 diplomatic relations between the United States and France were broken off on account of the latter's threatening attitude due to alleged preference of England by the United States in treaty stipulations. War seemed inevitable, when Logan conceived the idea of visiting France and attempting in his own private capacity to avert the threatened conflict. Accordingly, taking with him letters from Jefferson and Governor McKean, he went to Paris, where he was well received by Talleyrand and other influential Frenchmen and succeeded in inducing the French government to release American prisoners and annul the embargo on American shipping. But though he thus prepared the way for negotiations resulting in the reëstablishment of peaceful relations, his action was looked upon as unwarrantable meddling by the United States government; the President and cabinet refused to have any dealings with him, and he received what was in effect a severe rebuke from Washington, then commander in chief. To prevent such action in the future, Congress shortly afterward passed a law, called the Logan Act, which made it a misdemeanor for a person not properly accredited by the government to hold intercourse with a foreign government in order to influence its relations with the United States. In 1810 Logan undertook, this time with the approbation of President Madison, a peace mission to England, but without success. He published *Experiments on Gypsum* and *Rotation of Crops* (1797).

LOGAN, James (1674–1751). An American Colonial statesman and author. He was born at Lurgan, County Armagh, Ireland, and in 1699 came to America as the secretary of William Penn. He entered the political life of the Pennsylvania Colony and rose high in its service, holding, among various offices, those of Provincial Secretary, Chief Justice, and President of the Council; then for two years (1736–38), by virtue of his office, he was acting Governor. In the field of science and literature his contributions were considerable. He wrote both in Latin and English and left translations of Greek and Latin authors. He was one of the founders of the University of Pennsylvania and bequeathed to the city of Philadelphia a library of more than 2000 volumes, which have been kept separate under the title of the Loganian Library. Among his works may be noted *Experimenta de Plantarum Generatione* and a translation of Cicero's *De Senectute*, printed by Benjamin Franklin and containing notes and a preface by him.

LOGAN, John (c.1725–80). A famous Indian chief, the son of Shikellamy, a Cayuga chief noted for his friendship with the whites. His real (Indian) name was Tahgahjute, but he was generally known by his English name, Logan, given to him in honor of James Logan, William Penn's secretary and a steadfast friend of the natives. For some time prior to his removal to the banks of the Ohio, about 1770, he lived near Reedsville, Pa., hunting and trading with the settlers, and soon became well known on the Pennsylvania and Virginia frontier as a brave chief, always friendly to the whites. He also became exceedingly popular among the Indians and about this time was chosen by the Mingoes as their chief. About this time, too, he became much addicted to intemperance. In April, 1774, several whites, headed by a man named Greathouse, the keeper of a whisky shop, murdered some of Logan's relatives in cold blood at Yellow Creek. Logan, frenzied by this blow, incited the already restive Indians forthwith to attack the whites and in the brief war which ensued (see Dunmore's War) was himself conspicuous for ferocity and cruelty, taking with his own hands as many as 30 scalps. He disdained to sue for peace along with the other chiefs, after the battle of Point Pleasant (q.v.), and instead sent to Lord Dunmore, by a trader named John Gibson, a message which is regarded as one of the finest examples of Indian eloquence, though its authenticity has been called into question. Its charge against Captain Cresap is certainly false, and it undoubtedly owes much to subsequent changes and embellishments. Jefferson in his *Notes on Virginia* quoted it (with modifications) and first directed general attention to it. After Lord Dunmore's War Logan became more and more intemperate. Finally (1780), while in a drunken frenzy, he clubbed his wife, fled, attacked a band of Indians, and was killed by his nephew in self-defense. Consult Brantz Mayer, *Tah-gah-jute, or Logan the Indian, and Captain Michael Cresap* (New York, 1867).

LOGAN, John (1748–88). A Scottish divine and poet, born in Mid-Lothian. He entered Edinburgh University in 1762, and was ordained a Presbyterian minister in 1773. In 1779–80 and 1780–81 he delivered a series of historical lectures which were published in 1781 under the title *Elements of the Philosophy of History.* The same year he published a volume of verse and in 1782 a lecture entitled *An Essay on the*

Manners and Governments of Asia. This was followed in 1783 by the tragedy *Runnamede.* Logan's connection with the stage through this tragedy and a habit he had developed of using stimulants aroused opposition among his parishioners; so in 1786, though one of the most popular preachers of his day, he resigned and went to London, where he devoted himself to literature. It has been claimed that his *Ode to the Cuckoo,* which Edmund Burke characterized as the most beautiful lyric in the English language, was stolen from the papers of Michael Bruce, a deceased friend, whose literary executor he was. But Small's investigations seem to have proved this contention groundless. Consult *British and Foreign Evangelical Review* (London, 1879) and Chambers's *Eminent Scotsmen* (Glasgow, 1847).

LOGAN, JOHN ALEXANDER (1826–86). An American soldier and political leader, born in Jackson Co., Ill., Feb. 9, 1826. He attended Shiloh College for a time and received a limited education. At the outbreak of the war with Mexico he enlisted as a private and became quartermaster of his regiment, with the rank of first lieutenant. In 1851 he graduated at the Louisville University and was afterward admitted to the bar. He was a member of the Illinois Legislature in 1852–53 and in 1856–57, was prosecuting attorney from 1853 to 1857, and was elected to Congress in 1858 as a Douglas Democrat. He was reëlected in 1860, but resigned his seat in 1861 to enter the army. He was made colonel of the Thirty-first Illinois Volunteers and led the regiment at Belmont, Fort Henry, and Fort Donelson; was wounded in the latter engagement, and in March, 1862, was appointed brigadier general of volunteers and a few months later major general. In the Vicksburg campaign he was in command of a division of the Seventeenth Corps and distinguished himself at Port Gibson and Raymond, Jackson, Champion Hill, and in the siege of Vicksburg. His command was the first to enter the town, of which he was appointed military governor. In 1863 he was put in command of the Fifteenth Corps. After the death of McPherson, he took command for a few days of the Army of the Tennessee in front of Atlanta in July, 1864. On being relieved by Gen. O. O. Howard, he returned to the command of his corps, which he led until the fall of Atlanta, when he obtained leave of absence to take part in the political campaign for the reëlection of Abraham Lincoln as President. He afterward rejoined his corps, leading it in the march through the Carolinas.

He was subsequently elected to Congress for two successive terms as a Republican, serving from 1867 to 1871, and was one of the managers of the impeachment of President Andrew Johnson. He was commander in chief of the Grand Army of the Republic from 1868 to 1871. In 1871 he was elected to the United States Senate. Soon after his admission to the Senate he distinguished himself by a speech on reconstruction. At the expiration of his term, in 1877, he settled in Chicago and began to practice law, but after a short interval of retirement was reëlected to the Senate. During his career in Congress he made a number of notable speeches, characterized by force and brilliancy. In 1880 he spoke for four consecutive days upon the Fitz-John Porter Bill, opposing the restoration of Porter to the army. He was a candidate for the presidential nomination at the Republican National Convention at Chicago in 1884, and after the ballot was announced which gave that nomination to James G. Blaine, he was nominated by acclamation as the candidate for Vice President. Soon after the defeat of the Republican ticket he was once more elected by the Republicans of Illinois as United States Senator. He died at Washington, Dec. 26, 1886. James G. Blaine said of him that no other man in the history of the country had combined the elements of successful military and legislative leadership in such an eminent degree. Major General Logan wrote a volume on the Civil War, entitled *The Great Conspiracy: Its Origin and History* (1886), a partisan account; and *The Volunteer Soldier of America* (1888). Consult G. F. Byron Andrews, *Biography of General John A. Logan, with an Account of his Public Services in Peace and in War* (New York, 1884), and Dawson, *The Life and Services of General John A. Logan as Soldier and Statesman* (Chicago, 1887).

LOGAN, MOUNT. The second highest peak of North America. It is situated in the southwestern corner of Yukon Territory, Canada, close to the Alaskan boundary (Map: Canada, C 4). Its height is 19,500 feet. It was considered the highest peak of the continent until 1898, when the United States Geological Survey found it to be exceeded by Mount McKinley. See MCKINLEY, MOUNT.

LOGAN, OLIVE (1839–1909). An American actress and author, daughter of Cornelius Ambrosius Logan. She was born in Elmira, N. Y., and, after being educated in Paris and London with a view to the stage, became an actress and subsequently a journalist and lecturer. In 1864 she appeared at Wallack's Theatre in New York City in her own play of *Eveleen.* She corresponded for many periodicals and wrote, besides plays (including a metrical rendering of Coppée's *Le Passant* and a dramatization of Wilkie Collins's *Armadale*), several books on theatrical matters, such as *Before the Footlights and Behind the Scenes* (1870).

LOGAN, STEPHEN TRIGG (1800–80). An American jurist, born in Franklin Co., Ky. He studied law and for a time practiced in his native State, but in 1832 emigrated to Illinois and opened a law office at Springfield. In 1835 he was made circuit judge and in 1842, 1844, and 1846 was elected to the Legislature. From 1841 to 1844 he was a law partner of Abraham Lincoln. In 1847 he assisted in framing a new State constitution and in 1854 was a fourth time elected to the Legislature. He became a Republican upon the formation of that party and in 1860 was a delegate to the Republican National Convention which nominated Lincoln. In the following year he went to the Peace Congress at Washington and then withdrew from public life. Logan was a lawyer of unusual ability and during his prime was regarded by many as the first member of the bar in the State of Illinois.

LOGAN, SIR WILLIAM EDMOND (1798–1875). A Canadian geologist. He was born in Montreal, of United Empire Loyalist descent, and was educated at Edinburgh High School and University. While studying the structure of the coal fields of South Wales, where he was in charge of copper smelters and coal mines in 1831–38, he discovered the "stigmaria clay" by which he refuted the drift theory of the origin of coal. From 1842 to 1869 Dr. Logan was the first director of the geological survey of Canada, where he brought to notice the supposed fossils of the Laurentian rocks called *Eozoön canadense.* His investigations of the crystalline rocks of Canada were of far-reaching importance. In 1851 he had charge of the Canadian geological collection at the London Exhibition and in 1855 he supervised the representation of Canadian mineral productions at the Paris Exposition. In 1856 he was knighted. He was elected a member of many learned societies in America and Britain and received medals from the Royal Society and the London Geological Society. His chief publication was *Geology of Canada* (1863), with Thomas Sterry Hunt. Consult his *Life* by B. J. Harrington (Montreal, 1883).

LO'GANIA'CEÆ (Neo-Lat., from Logania, named in honor of James Logan), THE LOGANIA FAMILY. A family of plants including about 30 genera and 400 species and widely distributed in warm and tropical regions. They are herbs, shrubs, and vines, and in the tropics there are some trees. The family is characterized by its opposite and entire leaves, but chiefly by its four or five parted and hypogynous flowers. It is very closely related to the Rubiaceæ (madder family), which has four-parted but epigynous flowers. The plants of this family are characterized by a bitter principle which is often extremely poisonous. They include the genus *Strychnos*, of which nux vomica (q.v.) is one of the products, and another is the woorali or curari (q.v.) poison. The principal representatives of the family in the United States are the pinkroot (*Spigelia marilandica*), which is believed to have medicinal properties, and the yellow jessamine (*Gelsemium sempervirens*).

LO'GANSPORT. A city and the county seat of Cass Co., Ind., 77 miles by rail north by west of Indianapolis, at the confluence of the Wabash and Eel rivers, and on the Pittsburgh, Cincinnati, Chicago, and St. Louis, the Vandalia, and the Wabash railroads (Map: Indiana, E 3). It has a fine county courthouse of brick, a public library, 15 acres of parks, and the Northern Indiana Hospital for the Insane, on the south side of the Wabash, comprising a cluster of buildings with a farm of more than 300 acres. There are several bridges within the municipal limits across the Wabash and Eel rivers. The city is an important railroad centre, with shops of the Pittsburgh, Cincinnati, Chicago, and St. Louis and the Vandalia Line; controls a large trade in lumber and in the produce of the surrounding agricultural country, and manufactures automobiles, radiators, lumber, carriages, plow handles, flour, baskets, lime, brooms, window shades, kitchen cabinets, soaps, and foundry products. Abundant water power and a supply of natural gas are valuable industrial advantages. Logansport, first incorporated in 1838, is governed by a mayor, chosen every four years, and a council, which elects the school board and all officers in other municipal departments, excepting the police commissioners, who are appointed by the Governor. The water works and electric-light plant are owned and operated by the municipality. Pop., 1900, 16,204; 1910, 19,050; 1914 (U. S. est.), 20,262; 1920, 21,626.

LOGAŒDIC (lŏg'ȧ-ē'dĭk) **VERSE** (from Gk. λόγος, *logos*, speech + ἀοιδή, *aoidē*, song; so called because the verse, as interpreted by the ancient exponents of logaœdic rhythm and their modern followers, resembles, in part at least, prose, since the consecutive feet seem not to be equal one to the other, as they are in proper musical compositions). In Greek and Latin prosody, a rhythm in three-eighths time, based on the trochee (—⏑), but admitting with great freedom the substitution of other feet. The most common substitutions are the cyclic dactyl (—‿ ⏑), which can usually be employed but once in any one verse; the irrational trochee (— >), so called because its parts seem not to be related to each other in the normal trochaic ratio of two to one (back of this view of logaœdic rhythm lies the assumption that a long syllable had two beats, a short syllable but one); the triseme (⏗); the tribrach (⏑ ⏑ ⏑); and occasionally in the first foot an iambus (⏑—). Anacrusis, an unaccented initial syllable, is employed in certain forms. The sign ∧ indicates a rest.

The principal logaœdic forms are the following (it must be remembered that the last-written syllable of any Greek or Latin rhythm may be either long or short, regardless of the theoretical requirements of the metre. To show this, the last syllable in logaœdic verse is often marked ⏒):

I. DIPODY

1. *Adonic:*

—‿ ⏑ | — ⏑
πότνια | θῦμον
terruit | urbem

II. TRIPODIES

Pherecratics. These are called *First* or *Second Pherecratic*, according to the foot in which the cyclic dactyl is used.

2. (a) *First Pherecratic* or *Aristophanic:*

—‿ ⏑ | — ⏑ | — ⏒
Κασταλί | ας τε | νᾶμα
Lydia | dic per | omnes ∧
or —‿ ⏑ | — ⏑ | ⏗ | ⏒ ∧

(b) *First Pherecratic catalectic*, not found in Latin:

—‿ ⏑ | — ⏑ | — ∧
ἡ πόλις | ἡ φί | λων ∧

3. (a) *Second Pherecratic:*

— > | —‿ ⏑ | — ⏒
ἁ πάν | δυρτος ἁ | ηδών
grato | Pyrrha sub | antro ∧
or — > | —‿ ‖ ⏑ | ⏗ | ⏒ ∧

(b) *Second Pherecratic catalectic*, not found in Latin:

— > | — ⏑ ⏑ | — ∧
ἐχθίσ | των ἀνέ | μων ∧

Besides the forms given above, we also find in the Greek tragedians verses in which the first foot is an iambus or a trochee. Also such verses as

—‿ ⏑ | —‿ ⏑ | — ∧, ⏑ ⋮ —‿ ⏑ | —‿ ⏑ | — ∧
⏑ ⋮ ⏗ | —‿ ⏑ | — ∧, ⏑ ⋮ ⏑ ⏑ ⏑ | — > | ∧, etc.

III. TETRAPODIES

Glyconics. These also are named *First, Second*, or *Third*, according to the position of the cyclic dactyl.

4. *First Glyconic*, not found in Latin:

—‿ ⏑ | — ⏑ | — ⏑ | — ∧
ἵππι' ἄ | ναξ Πό | σειδον, | ᾧ ∧

5. *Second Glyconic:*

— > | —‿ ⏑ | — ⏑ | — ∧
πόντου | χειμερί | ῳ νό | τῳ ∧
emi | rabitur | inso | lens ∧

6. *Third Glyconic*, not found in Latin:

— ⏑ | — ⏑ | —‿ ⏑ | — ∧
φῶτα | βάντα | πανσαγί | ᾳ ∧

A great variety of these forms is found in Greek poetry, especially in Euripides; and in Æolic verse the First Glyconic is frequent with anacrusis, ≳ ⋮ —͜∪ ∪ | — ∪ | — ∪ | — ∪. This is known as the *Praxillean measure.* It is to be noted, however, that White (see below) refuses to scan Æolic verse as logaœdic. For the view that such verse is logaœdic, see Shorey's review of White's book, in *Classical Philology,* viii (1913).

7. *Enneasyllabic Alcaic:*

∪ ⋮ — ∪	— >	— ∪	— ∪
τὸ ⋮ δ' ἔνθεν	ἄμμες	δ' ἂν τὸ	μέσσον
sil ⋮ væ la	boran	tes ge	luque

8. *Lesser (decasyllabic) Alcaic:*

—͜∪ ∪	—͜∪ ∪	— ∪	— ≥
νᾶι φο	ρήμεθα	σὺν με	λαίνᾳ
virgini	bus pue	risque	canto

IV. PENTAPODIES

9. *Lesser Sapphic:*

—͜∪	— >̆	—͜∪ ∪	— ∪	— >̆
ποικι	λόθρον'	ἀθάνατ'	'Αφρο	δῖτα
inte	ger vi	tæ scele	risque	purus

Three *Lesser Sapphics* and an *Adonic* (1) form the Sapphic strophe.

10. *Greater (hendecasyllabic) Alcaic:*

> ⋮ —͜∪	— >̆	—͜∪ ∪	— ∪	— ∧
ἁ ⋮ συνέ	τημι	τῶν ἀνέ	μων στά	σιν ∧
o ⋮ di pro	fanum	volgus et	arce	o ∧

Two *Greater Alcaics,* an *Enneasyllabic Alcaic,* and a *Lesser Alcaic* form the Alcaic strophe.

11. *Dodecasyllabic Alcaic,* not found in Latin:

∪ ⋮ — ∪	— >	‖	—͜∪ ∪	— ∪	— >̆
ἰ ⋮ όπλοκ'	ἀγνά,	‖	μελλιχό	μειδε	Σάπφοι

12. *Phalæcean (hendecasyllabic):*

— >	—͜∪ ∪	—	‖	∪	— ∪	— >̆
χαῖρ' ὦ	χρυσόκε	ρως,	‖	βα	βάκτα	κήλων
cui do	no lepi	dum	‖	no	vum li	bellum

13. *Pindaric,* not used in Latin:

∪ ⋮ ⌞	— ∪	—͜∪ ∪	— ∪	— >
ὁ ⋮ Μου	σαγέ	τας με κά	λετ' χο	ρεῦσαι

V. COMPOSITE LOGAŒDIC VERSES

14. *Lesser Asclepiadean* (*Second* and *First Pherecratic catalectic*):

— >	—͜∪ ∪	⌞	‖	—͜∪ ∪	— ∪	—
λαβὰν	τῶ ξίφε	ος	‖	χρυσοδέ	ταν ἔ	χων ∧
Mæce	nas ata	vis	‖	edite	regi	bus ∧

15. *Greater Asclepiadean* (the above with a *Logaœdic Dipody* inserted between the parts of 14):

— ∪	—͜∪ ∪	⌞	‖	—͜∪ ∪	⌞	‖	—͜∪ ∪	⊍ ∧	
μηδὲν	ἄλλο φυ	τεύ	‖	σῃς πρότε	ρον	‖	δένδρι	ον ∧	
nullum	Vare sa	cra	‖	vite pri	us	‖	seve	ris ∧	

— ∪	— ∧
ἀμπέ	λω ∧
arbo	rem ∧

16. *Greater Sapphic* (*Third Glyconic* and *First Pherecratic*):

— ∪	— >	— ∪∪	⌞	‖	—͜∪ ∪	—͜∪
te de	os o	ro Syba	rin	‖	cur prope	res a

⌞	⊻ ∧
man	do ∧

This seems to be a modification of the verse used by Sappho:

— ∪	∪—	— ∪∪	⌞	‖	— ∪∪	— ∪
δεῦτέ	νυν ἀ	βραὶ Χάρι	τες	‖	καλλίκο	μοί τε

⌞	⊍ ∧
Μοῖ	σαι ∧

17. *Priapean* (a *Glyconic* and a *Pherecratic*):

— >	— ∪∪	— ∪	⌞	— >̆	— ∪∪
ψάλλω	πηκτίδα	τῇ φί	λῃ	κωμά	ξων παῖδ'
O Co	lonia	quæ cu	pis	ponte	ludere

⌞	— ∧
ἁ	βρῇ
lon	go >

In English these metres are rarely found except in imitations of classic lyric measures. Consult, for a convenient discussion in English of logaœdic verse, J. H. H. Schmidt, *Introduction to the Rhythmic and Metric of the Classical Languages,* translated by J. W. White (Boston, 1878); Gildersleeve and Lodge, *Latin Grammar* (ib., 1894); G. M. Lane, *Latin Grammar* (New York, rev. ed., 1903); T. D. Goodell, *Chapters on Greek Metric* (ib., 1902). The most recent discussion in English is J. W. White, *The Verse of Greek Comedy* (London, 1912). See VERSIFICATION.

LOGARITHMIC (lŏg'ȧ-rĭᴛʜ'mĭk) **CURVE** (from Gk. λόγος, *logos,* ratio, proportion, word + ἀριθμός, *arithmos,* number). A curve of a single branch, having for its equation $y = \log x : \log a$, $y = \log_a x$, or $x = a^y$. In particular, if $a = e$, then $y = \log x$, the ordinate being the logarithm of the abscissa, and the curve representing the natural (Naperian or hyperbolic) logarithm. The curve $y = e^x$ is sometimes called the exponential curve and is evidently the same as the logarithmic except as to its orientation, the two being symmetric with respect to the bisector of the angle XOY. The logarithmic curve was first studied by Gregory in his *Geometriæ Pars Universalis* (1668) and was considered under the names *logarithmica* and *logistica* by Huygens in his *De Causa Gravitatis* (1690).

LOGARITHMIC SERIES. See SERIES.

LOGARITHMIC SPIRAL, or LOGISTIC SPIRAL. A spiral having for its polar equation $r = ae^{m\theta}$. Since it possesses the property that $\tan V = r : r' = 1 : m =$ a constant, it cuts the radius vector under a constant angle and is therefore also called the equiangular spiral. It was first brought to the attention of mathematicians by Descartes, in his correspondence beginning in 1637. Its properties were first carefully studied by Jakob Bernoulli in the *Acta Eruditorum* (1691) and have since then been extensively investigated. Consult Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897) and *Partie complémentaire* (ib., 1899). See SPIRAL.

LOG'ARITHMS. A tabular system of numbers, by which multiplication can be performed by addition, division by subtraction, involution by a single multiplication, and evolution by a single division. The logarithm of a number is the exponent of the base which produces the number. If $a^x = b$, x is said to be the logarithm of b to the base a. Any finite positive number greater than 1 may be taken for a base, and the logarithms of all positive numbers with respect to the base may be tabulated. The base 10, however, has been found the most convenient, and the system of "common logarithms" constructed upon it is universally used for arithmetical computations. The accompanying brief tables will serve for purposes of illustration.

In the first of these tables $\bar{3}$ means -3, and $\bar{3}.3010$ means $-3 + 0.3010$. According to the definition, $\bar{3}$ is the logarithm of 0.001, written $\log 0.001 = \bar{3}$; $\log 0.002 = \bar{3}.3010 \ldots \log 10{,}000$

$= 4$. The integral part of the logarithm is called the *characteristic*, and the decimal part the *mantissa*. The characteristics of the logarithms of positive numbers less than 1 are negative, those of numbers not less than 10 are positive, and those of numbers between 1 and 10 are zero. The mantissas are always taken as positive and are generally incommensurable. A table of mantissas expressed to six decimal places is sufficiently accurate for all ordinary purposes. In the common system it is unnecessary to tabulate the characteristic, since its value is always one less than the number of places to the left of the decimal point. For example, log 659.34 = 2.819109. Another advantage of the common system is that the mantissas of the logarithms of numbers having the same sequence of figures are equal. For example, log 659.34 = 2.819109 and log 65934 = 4.819109. These two properties belong to the common system only, and to them it owes its superiority over other systems for the purposes of numerical calculations.

$10^{\bar{3}} = 0.001$	$10^{0} = 1$	$10^{2.8451} = 700$
$10^{\bar{3}.3010} = 0.002$	$10^{0.6990} = 5$	$10^{3} = 1000$
$10^{\bar{2}} = 0.01$	$10^{1} = 10$	$10^{3.5441} = 3500$
$10^{\bar{2}.4771} = 0.03$	$10^{1.8451} = 70$	$10^{3.6902} = 4900$
$10^{\bar{1}} = 0.1$	$10^{2} = 100$	$10^{4} = 10000$

log 1 = 0.0000	log 6 = 0.7782
log 2 = 0.3010	log 7 = 0.8451
log 3 = 0.4771	log 8 = 0.9031
log 4 = 0.6021	log 9 = 0.9542
log 5 = 0.6990	log 10 = 1.0000

The logarithm being an exponent, it must obey the laws of exponents, and from these are derived the fundamental principles of logarithmic calculation: 1. The logarithm of a product is equal to the sum of the logarithms of its factors. 2. The logarithm of the quotient of two numbers is equal to the logarithm of the dividend less the logarithm of the divisor. 3. The logarithm of a number affected by an exponent is equal to the exponent times the logarithm of the number. 4. The logarithm of a root of a number is equal to the logarithm of the number divided by the index of the root. For example, to multiply 50 by 70, $\log (70 \times 50) = \log 70 + \log 5 + \log 10 = 1.8451 + 0.6990 + 1 = 3.5441$ from the first of the above tables. But the number corresponding to the log 3.5441, called the antilogarithm, is 3500, $\therefore 70 \times 50 = 3500$. Also to extract the square root of 4900, $\log \sqrt{4900}$ or $\log 4900^{\frac{1}{2}} = \frac{1}{2} \log 4900 = \frac{1}{2}$ of $3.6902 = 1.8451$ from the table. But the antilog 1.8451 is 70, $\therefore \sqrt{4900} = 70$. In finding the logarithm of a quotient, especially when the divisor contains several factors, it is easier to add the complement logarithm or cologarithm of the divisor than to subtract its logarithm. The cologarithm of a number is defined as the logarithm of the reciprocal of the number. The $\text{colog}\ n = \log\frac{1}{n} = -\log n$, which justifies its use as explained.

John Napier (1614), a Scotchman, is usually regarded as the inventor of logarithms. Bürgi (1552–1632) as early as 1607 had probably computed a table of antilogarithms, but he did not fully understand the importance of the invention and failed to make it public until 1620, when Napier's logarithms were known throughout Europe. Bürgi's *Arithmetische und Geometrische Progress-Tabulen* was published in 1620 in Prague and contains logarithms of ordinary numbers, while Napier's *Mirifici Logarithmorum Canonis Descriptio* contains logarithms of trigonometric functions. (See TRIGONOMETRY.) Tables of the numerical values of the trigonometric functions had attained a high degree of accuracy at this time, but their usefulness depended upon abridged methods of calculation, and the search after such methods led to the discovery of logarithms. Napier observed that if in a circle with the radii OA_0, OA_1, $(r = 1)$ at right angles, the sine S_0S_1 parallel to OA_1 moves from O to A_0 at intervals forming an arithmetic progression, its value decreases in geometric progression. The segment OS_0 Napier originally called *numerus artificialis*, and later *logarithmus* (ratio number). The first computers of logarithms did not understand the connection between logarithms and exponents, but modern investigations show that 2.7184593 is the base of Bürgi's logarithms, and that $\frac{1}{2.718281828}$ is the base of Napier's. Speidell (1619, 1624), in adapting Naperian logarithms to positive integers, employed as a base 2.718281828, known since the time of Euler as e. This system was called by Halley the Naperian system, and this name has been retained, so that to-day "Naperian logarithms" mean logarithms to the base e. Such logarithms are also called natural logarithms, and the relation between Naperian logarithms of a sine S and its natural logarithm is expressed by the equation $\text{Nap. log } S = 10^7 \text{ nat. log } \frac{10^7}{S^1}$ 10^7 being taken as the sine of 90° and its logarithm zero. According to the integral calculus, the equation $\int \frac{dx}{x} = \log x + k$ may serve as a definition for the logarithm of a number, and from it is derived a relation which gives to the natural logarithm the name "hyperbolic logarithm." The equation of a rectangular hyperbola (q.v.) referred to its asymptotes is $xy = c$, hence $y = \frac{c}{x}$, and $ydx = \frac{cdx}{x}$, an element of area of base dx and altitude y between the curve and the x-axis; the area between the curve, the x-axis, and two ordinates at x_1, x_2, is proportional to $\log \frac{x_2}{x_1}$.

It appears from the definition that logarithms formed from one base must bear a constant ratio to those formed from another base. This ratio is called the *modulus* of the first system. The modulus of the common system is 0.43429448 . . . .; hence, if the hyperbolic logarithm of a number is l, its common logarithm is $0.43429448l$.

The calculation of tables of logarithms may be effected in many ways. Henry Briggs (1624), who suggested the common system with base 10, calculated to 14 decimal places the logarithms of numbers from 1 to 20,000 and from 90,000 to 100,000. From the logarithms of perfect powers of 10 he approximated the intermediate logarithms by continually computing geometric means between two numbers, one greater and the other less than the number required. Thus, to find the log 5 take the geometric mean between 1 and 10, or 3.162, the corresponding arithmetic mean (log 1 being 0, and log 10 being 1) being 0.5; the geometric mean between 3.162 . . . . and 10, or 5.623, corresponds to the arithmetic mean between 0.5 and 1, or 0.75, the geometric mean between 3.162 and 5.623, or 4.216, has its logarithm = ½ (0.75 + 0.5), or 0.625. This operation is continued until the result is obtained to the necessary degree of accuracy. More recent methods, however, are based upon the logarithmic series. If 1 is put for u in the formula, $\log_e(u+1) = \log_e u + 2\left[\frac{1}{2u+1} + \frac{2}{3(2u+1)^3} + \frac{1}{5(2u+1)^5} + \ldots\right]$, the Naperian logarithm of 2 is at once obtained to any degree of accuracy required; if 2 is put for u, the Naperian logarithm of 3 can be calculated, and so on, and the common logarithms may be obtained by applying the modulus.

Vlacq (1628) supplied the logarithms for the numbers omitted by Briggs. Gellibrand and Vlacq published tables for the logarithms of the trigonometric functions for every minute of the quadrant.

For a full account of the construction of the early tables, consult the introduction to Hutton's *Mathematical Tables and Mathematical Tracts* (London, 1812). Gauss introduced addition and subtraction logarithms and computed tables which have been largely drawn upon by subsequent writers. Vega's *Thesaurus Logarithmorum Completus* (Leipzig, 1794) had a wide circulation. Contributions to the rapid calculation of logarithms have been made by Koralek (1851), and especially by R. Hoppe in his *Tafeln zur dreissigstelligen logarithmischen Rechnung* (Leipzig, 1876). Other thoroughly reliable tables are by Callet (Paris, 1795, and subsequent editions); Bremiker (Berlin, 1857; 11th ed., 1890); Schrön (Leipzig, 1860, 1886–90; Eng. ed. by De Morgan, London, 1865); J. H. Gore (New York, 1907); E. V. Huntington (Cambridge, Mass., 1908); K. C. Bruhns (8th ed., New York, 1909); W. A. Granville (Boston, 1909); L. L. Conant (New York, 1909); Smoley (ib., 1912); C. J. Moore (Boston, 1913). Consult also E. W. Hobson, *John Napier and the Invention of Logarithms, 1614* (Cambridge, Eng., 1914). See Arithmetic Complement.

LOGAU, lō′gou, Friedrich, Baron (1604–55). A German epigrammatist, born at Brockut in Silesia and educated at Brieg and Frankfort-on-the-Oder. He entered the legal service of the Duchy of Liegnitz as chancery councilor, but is far better known as a poet of the "first Silesian school," as the "Detractor" of the *Fruchtbringende Gesellschaft*, which he joined in 1648, and, under the pseudonym Salomon von Golaw, as author of a large and important collection of epigrams, *Erstes Hundert Teutscher Reimen-Sprüche* (1638). A second volume is entitled *Deutscher Sinn-Getichte Drey Tausend* (1654). An edition of selections from Logau's epigrams, with linguistic commentary, was published by Lessing and Ramler (Leipzig, 1759); a complete edition by Eitner (Stuttgart, 1872) succeeded his smaller edition with biography (Leipzig, 1870). Consult K. Haehnel, *F. V. Logau* (Pilsen, 1883), and Kürschner, *Deutsche National-Litteratur*, vol. xxviii (Berlin, 1885).

LOG BOOK. The log book is the official record book of a ship and contains a brief statement of the weather encountered, the speed made, positions of the ship as daily determined by astronomical observations or by dead reckoning, and a short account of all occurrences of importance at sea and in port. The log book of a man-of-war is a large book of folio size, and two pages facing each other are allotted to the records for each day. The left page is about half covered by the "columns." These are filled in every hour at sea and in port, and the record consists of the speed of the ship during each hour, the reading of the patent log (if used), the course by compass (gyro or magnetic, or both), the leeway (if any), the height of barometer and thermometer, readings of the hygrometer, temperature of the sea water, amount of clouds and their character and movements, and the state of the sea. Below the ruled spaces are spaces for recording the amounts of coal and distilled water on hand and received; the latitude, longitude, current, deviation of the compass, etc., as determined by observations of heavenly bodies and by dead reckoning; and other information. The right page is for remarks upon miscellaneous subjects and amplifying the data given in the columns when that is necessary. The remarks are written up at the end of every watch (q.v.), and, in addition to the description of all events passing under the eye of the watch officer, there is recorded an account of all official transactions, such as enlistments, discharges, court martials, drills, inspections, boards of survey, signals to other vessels (formerly; now entered in a special signal record book), accidents of importance, deaths, and other similar matters. The remarks written by each officer are signed by him; a smooth copy, made daily, is also signed, and, when the book is full, forwarded to the Navy Department. Signal log books give a record of all signals sent or received. Radio (wireless) logs show all radio messages sent or received which refer to the business of the navy. Commercial messages sent, received, or relayed, are separately recorded.

LOG-CABIN HARRISON. A name widely used of William Henry Harrison, said to have originated in a sneering remark in the correspondence of the Baltimore *American* during Harrison's presidential campaign. The phrase was at once taken up as a party cry by the friends of Harrison and became extremely popular.

LOGCOCK. The pileated woodpecker. See Woodpecker.

LOGFISH. See Rudder Fish.

LOG′GAN, or **LOG′AN.** See Rocking Stone.

LOG′GERHEAD. 1. A large carnivorous sea turtle (*Thalassochelys caretta*), covered with bony plates and generically distinguished by having costal shields on each side of the carapace, which finally become ossified. This is a very large species of sea turtle and may attain a weight of 450 pounds. Its flesh is rank and tough, but the eggs, which the female deposits at night on the sandy shores of southern islands, are much sought for. It ranges from Brazil to Massachusetts, and the Gulf of Mexico has another species or variety (*kempii*). Gosse says these turtles feed on mollusks, including cuttlefish, and can crush large conchs in their powerful parrot-like jaws. Cf. Hawksbill Turtle.

2. In ornithology, the name of several birds: (*a*) an American shrike (see Shrike); (*b*) one or more species of West Indian tyrant flycatchers; (*c*) a large almost flightless duck of southern South America. See Steamer Duck.

LOGGIA, lŏd′jȧ (It., lodge, gallery). An Italian word, somewhat loosely used to designate any roofed structure open on one or more sides to the weather: an arcade, gallery, porch, veranda, or isolated shelter. It is thus applied to such varied buildings as the following prominent examples: (1) the Loggie of the Vatican, the three superposed arcades of the court of San Damaso, decorated by Raphael and his successors; (2) the open porch in front of the church of Santa Maria della Grazie at Arezzo, by Benedetto da Majano; (3) the two-storied arcade or veranda of the Farnesina at Rome by Peruzzi (1517); (4) the Loggia del Bigallo at Florence, a small but ornate fourteenth-century porch or entrance to a fraternity hospital now disused; (5) the great Loggia dei Lanzi at Florence, an isolated vaulted shelter for the Lancers or civic guard, built in 1376 probably by Benci di Cione and now used as a museum of statuary; (6) the Loggia dei Nobili, of approximately the same date and style, and (7) the Loggia del Papa, built in 1462, both at Siena, open vaulted shelters by the side of the street; and (8) the Loggia dei Banchieri at Genoa, built in 1570 to serve as an exchange, an open vaulted hall 60 x 90 feet, now closed in with glass. In American usage the word generally means a room open on one side to the air.

LOGGING. See Lumber Industry.

LOGHEM, lō′gĕm, Martinus Gesinus Lambert van (1849–). A Dutch poet and novelist, born at Leyden. After 1877 he lived in Amsterdam, where he was first employed in teaching, then in practicing law, but after 1883 devoted himself exclusively to journalism and literature. A narrative poem, "Een liefde in het Zuiden" (Love in the South), published 1881 under the pseudonym Fiore della Neve, met with uncommon success and was followed by the lyric cycles *Liana* (1882), *Van eene Sultane en andere gedichten* (1884), and *Walter* (1892). He proved himself an admirable delineator of character in his novel *Victor* (1888) and the collections of stories *Blond en blauw* (1888) and *Panache* (1892); *Fortuin* (1898); *Koningin Wilhelmina-album* (1896–99); *Geen druiven van doornen* (1903); *Jonquilles* (1900); *Maleghys* (1904). Consult, for biography, an article by Taco de Beer in *Noord en Zuid*, part xxiii.

LOGIA AMERICANA. See Gran Reunion Americana.

LOGIC (OF., Fr. *logique*, from Lat. *logica*, *logice*, from Gk. λογική [sc. *τέχνη*], *logikē* [sc. *technē*], logic, logical [sc. art], from λόγος, *logos*, word, reason). Among the conscious processes treated by psychology (q.v.) are processes of thought. Psychology treats these processes as mental occurrences and endeavors to ascertain the conditions under which they appear. But they are something more than mere occurrences. They have a peculiar character, which consists in the fact that they purport to be valid, and some of them are subsequently confirmed to be valid and others invalid. Both valid and invalid thought processes are of equal value to the psychologist, inasmuch as both are actual occurrences and equally demand scientific investigation as to the actual conditions under which they appear. Hence there is room for another science which investigates the differences between valid and invalid thinking and states the standards to which thinking must conform in order that it may be valid. This science is called *logic*, a name first applied to it by the Stoics. There is another science which also deals with the validity of our thinking processes, along with the question of the validity of our knowledge in general. This science is called *epistemology*, or the theory of knowledge (q.v.). Many thinkers, especially in recent years, have made no distinction between logic and epistemology, but it is perhaps better to use the word "logic" in the sense which it exclusively had for over 2000 years until the time of Kant, and which it has had prevailingly ever since, and to apply the term "epistemology" to the science which deals, not with the question, In what way must we think in order that our thoughts may be valid? but with the more fundamental questions, Is our knowledge valid at all? and if so, What must be the relation of the knowing consciousness to the object known? Kant (q.v.) used logic in a larger sense, which made it include the treatment of this question of the relation of the knowing consciousness to the known object, but he carefully distinguished the two meanings of the word. He thus recognized two kinds of logic, general and transcendental. General logic for Kant is the science which "deals only with the pure form of thought," i.e., only with the ways in which thought proceeds when it works correctly. Transcendental logic sets forth "the origin, the limits, and the objective validity of our pure conceptions"; i.e., it deals with questions of epistemology and of the philosophy of nature. Nowadays it is the fashion, especially in Germany, to call the scientific treatment of such questions epistemological logic (Ger., *erkenntnisstheoretische Logik*). However, in this article the word will be limited to the science which treats merely of the norms or standards to which our thinking must conform if its results are to be valid, and a brief statement will be given of what has traditionally been included in the scope of logic, with only a criticism here and there. The more recent developments of logic will be found briefly indicated under other titles. See Instrumentalism; Pragmatism.

Taking for granted, then, that we can have knowledge which is really valid, the question which logic as treated here asks and tries to answer is, According to what standards must the thinking processes work in order that knowledge, so far as it is gained by thought, may be valid knowledge? In other words, What are the laws of valid thinking? But this question cannot be answered until we have first ascertained the method by which these laws of valid thought may be discovered. There are two theories on this subject—one which maintains that these laws are known a priori (q.v.), the other that they are known a posteriori. Thus, we have a school of rationalistic logicians and a school of experiential logicians. Among the most pronounced advocates of rationalistic logic stand Wolff (q.v.) and Kant. The latter says of "general logic" (practically logic as here treated) that "as pure logic, it has no empirical principles. . . . Logic is a demonstrative science, and whatever it contains must be certain entirely a priori" (Watson's translation). Opposed to Kant are many thinkers who maintain that these standards of correct thinking are discovered by experience. We think, and some of our thoughts prove valid, i.e., they lead us to results which are confirmed by all experience; others of our thoughts are not valid, i.e., subsequent experience does not confirm them. Now, by examination, so it is claimed, we discover that valid thinking is characterized by certain features; it is all reducible to certain types. These types are the norms or laws of thought. Thus, logical laws are on a par with physical laws.

Physical laws are statements of the way in which physical bodies act. Logical laws are statements of the way in which correct thinking proceeds. It is only experience, this school asserts, which can reveal to us these laws.

It is impossible in this article to go thoroughly into this question at issue between experiential and rationalistic logicians. All that can be said is that, as a matter of fact, Aristotle's logic was merely a statement, empirically grounded, of the processes of correct thinking; and all logical advance since Aristotle's day, notably Mill's addition of scientific induction to logic, has been secured by a careful study of the actual processes of what is generally regarded as correct thinking. That is, the science of logic in fact originated and has grown on experiential foundations. There is no a priori necessity that we should think logically; otherwise there would be no illogical thinking going on in the world. Neither is there any way of showing that a certain mode of thinking is incorrect except by showing that it actually leads to error. A teacher in logic who wishes to show the fallaciousness of a certain style of reasoning does not appeal to any inner consciousness or a priori intuition of his pupil. He shows in the concrete, i.e., by example, that this style of reasoning issues in mistaken conclusions. For example, when he tries to show that it is not correct to say that, because all M is P and all M is S, therefore all S is P, he points out that the correctness of the formula would involve the correctness of the argument that all ducks are fowls and all ducks are animals, therefore all animals are fowls. Again, it is not correct to say that, because B comes after A, it is the effect of A. Why? Because such a formula would justify Chanticler's conclusion that "the cock, with lively din, scatters the rear of darkness thin." Experience, however, shows that the cock with his crowing does not have any perceptible influence in dispelling darkness. Hence the formula is incorrect, and reasoning according to that formula is fallacious. But there are other formulas which express the processes of correct thinking. These formulas are obtained by comparing actual trains of thought which lead to valid conclusions and by discovering thereby their structure. According to this view the standards of correct thinking are analogous to sanitary or hygienic standards. We do not begin life with a self-evident and subsequently unchangeable standard of healthful living; on the contrary, our standards in this matter are derived from an examination of the results of various ways of living.

Now, all thinking is judging, and all thought is judgment (q.v.). A judgment can always be analyzed into subject and predicate. The *subject* of a judgment is either a percept or a concept (q.v.). Of the judgments that appear earliest in thought, the subjects are without doubt percepts. It is the business of psychology to investigate the origin of percepts. Logic accepts these percepts as given facts any question about whose origin is of no pertinence to its inquiry, inasmuch as it is merely interested in the manner in which these percepts are manipulated by thought; or, in other words, in the various changes which percepts undergo and in the various relations into which they enter, when they become elements in a thought process. Nor are even all these changes undergone by percepts of direct bearing upon the problems of logic. For instance, before any judgment can be made upon a percept, attention (q.v.) is necessary. This state of attention is a very difficult state for the psychologist to deal with; but none of these perplexities are of immediate interest to the logician as logician. He accepts the results produced by attention without bothering himself with questions as to the nature and conditions of attention. Only those changes of percepts which have a direct bearing upon the validity of judgments are treated in logic. These changes are all summed up in the words analysis (q.v.) and generalization, to which may be added comparison (q.v.), inasmuch as neither analysis nor generalization occurs without comparison. Indeed, analysis, comparison, and generalization are really different aspects of the same process. It is at first probably only as one percept is compared with another that any analysis can be made of either of them; and this analysis is possible only as some attribute is discovered to be common to them. And yet this discovery of a common attribute is ipso facto an analysis of the percepts. It is usual to add that, before a percept can figure in judgment, the common attribute predicated of it must be associated with some word or phrase. That is, many logicians claim that language is a necessary precondition of all judgment. Thus, Sigwart says that "it is essential that this" predicate idea "should be taken from those of our ideas which are already known to us and named by words which are understood. It must be an idea which has been already received into consciousness, which is connected with a word enabling us to retain and reproduce it, and which is distinguished from all other ideas . . . I cannot say 'this is blue, this is red,' unless I am already familiar with the ideas blue and red and can reproduce them with the word. Judgment is possible only when a number of such distinct ideas are retained and easily called into consciousness" (Eng. trans.). But Sigwart acknowledges that "some thought is already involved in the process by which these ideas are formed." He excludes the consideration of such thought from logic simply because it "precedes conscious and intentional thought." The difference then between the view advocated by Sigwart and that presented above does not concern the facts, but it concerns the definition and scope of logic. If logic is the science of the conditions of all correct thinking, then judgments whose predicates have no names must be included in its treatment. Otherwise logic must be defined as the science of the conditions of correct intentional thought; and such a definition unwarrantably restricts the meaning of a word that for ages has had a wider denotation. Logic then should treat of the processes by which a percept is recognized as having a qualifying feature even though the thinker has as yet no name for it at his disposal.

Predicate ideas are, in one sense, always general; in another sense they may be singular. It is at first perhaps only as one percept is compared with another that a feature is recognized in either as qualifying it. A common feature, recognized as qualifying several percepts, is a general idea, and when it is named the term used to designate it is called a general term. But a feature may be peculiar to one object, which at various times presents itself to observation, and may be recognized as qualifying the object each time it appears. In such a case the feature, recognized as characterizing the percept every time it appears is common to the various appearances of the percept, but peculiar to the percept. Whether, therefore, the idea of that feature be considered general or singular depends upon the point of view. Again, any feature which experience presents as a peculiar attribute of an object of perception may appear as a common attribute of various imaginary objects and in this way be a general idea. In a similar manner, upon the point of view depends the essential or accidental character of an attribute of an object. The accidental character is thus not inherent in the particular quality, but is determined by the selective nature of thought, and exists only for the particular purpose of judgment.

Every general idea is technically called a concept and may be simple or complex; i.e., it may or may not be incapable of analysis (q.v.). The results of an analysis of a concept are collectively called its connotation (q.v.) and are severally called its marks; the objects which such a concept qualifies are its denotation (q.v.). The detailed statement of the connotation of a term is called definition (q.v.); a systematic statement of its denotation is called division (q.v.). In general, but not with a mathematical accuracy, denotation and connotation vary inversely; the larger the number of marks in a concept, the fewer will in all probability be the number of real objects which are qualified by the concept. Traditional logic has distinguished between concrete and abstract terms. A term is concrete when it names a total percept or image with its full complement of features; it is abstract if it names only certain of these features whose existence presupposes the rest. The test of a full complement of features is the ability of these features to function as percept or image without need of supplementation by further features. Thus, animal is the name of various percepts or images; the term is therefore concrete. Animality is the name of a certain feature or complex of features characterizing those percepts or images, but the feature or complex of features known as animality is unable to function in consciousness as a percept or image; hence animality is an abstract term. It will be noticed that, while animal is a name applied to complete percepts or images, it is thus applicable only because of the attribute of animality which they possess. It names, or technically it *denotes*, the percepts or images; it makes reference to, or technically it *connotes*, the attribute of animality, by virtue of the possession of which the percepts or images have a right to be denoted by the term. Hence, contrary to the traditional opinion, concrete terms are not names of concepts at all; they are names of percepts or images, while at the same time they usually connote concepts. Some concrete terms are said to be nonconnotative, i.e., they do not specifically refer to any definite concept which characterizes the objects they name. Proper names, strictly so called, are to all intents and purposes nonconnotative. Thus, St. Louis is a name given to a city which is identifiable by various characteristics, not one of which is referred to directly by the name it bears, and not one of which is singled out for purposes of identification. Many so-called proper names are not absolutely "proper" in that they indicate sex or family relationships or nationality or other traits; hence they are to a certain extent connotative. This distinction between connotative and nonconnotative terms is really a matter of language, not of logic; for although the *name* St. Louis does not refer explicitly to any fixed mark possessed by the object it denotes, no *thinker* can employ the term without thinking that object as characterized by some mark. It is by him identified in some fashion by some character that distinguishes it. If not characterized in some way, it is not an object of thought at all. Again, traditional logic divides terms into positive and negative. Corresponding to this distinction in terms, there is in consciousness a twofold character belonging to every concept. As we have seen, a concept is obtained by analysis of a percept. Analysis always involves distinction of one element of a complex from another, and "distinction is negation" (Spinoza). To distinguish one thing from another is to recognize that it is what the other is not. Concepts thus owe their origin to a primitive negative aspect in the original judgment that breaks a percept up into its constituents. The result of such an analyzing judgment is a complex of differentiated perpetual features or concepts. Now, a concept, in proportion as emphasis is laid on the difference between it and another concept, becomes negative. In order to have any significance at all as part of an object of consciousness, it must indeed have some positively experienced content, either sensational, affectional, or relational. But this content may be practically neglected, and attention may rest almost entirely on its mere difference from other contents of consciousness. A negative term is one whose connotation is an idea negatively conceived. Thus, "inhuman" began as a negative term, because, although in order to have any meaning it must connote some positive feature of experience, still attention was given to its *difference* from another positive feature. A positive term, on the contrary, connotes an idea, conceived with stress on its perceptual or affectional or relational content rather than on its mere difference from other contrasted contents. Thus, "inhuman" as now used generally means cruel, and the perceptual and emotional features connoted by the term are more prominent in thought than those perceptual and emotional features with which this connotation is contrasted. Thus, we see that the philological form of a term is no infallible index to its positive or negative quality in logic.

The traditional distinction between absolute and relative terms is related to the distinction we have just discussed. Negative terms are, from the very nature of the case, relative. But not all positive terms are absolute, for there is positiveness as well as negativity in all relation. Elements related to each other are indeed each what the other is not, but also each may be in some respect or feature what it is by virtue of what the other is. A relative term is one which denotes an object and connotes some relation in which that object stands. Thus, the term "father" names a male and connotes a relation in which such male stands to certain other beings of the same species, viz., his sons and daughters.

It must be borne in mind that all these distinctions between concepts are distinctions between integral constituents of judgment. The doctrine of concepts—or, as it is often called, the doctrine of terms—is not an independent branch of logic. It is part of the doctrine of judgment, although tradition has given it an independent treatment and has included within the doctrine of judgment only a discussion of the quality and quantity of judgments. Quality is a term applied to judgment to express the character it has as affirmative or negative. A judgment is affirmative if it is the recognition of the fact that the subject possesses a certain qualifying feature; it is negative if it is the recognition of the fact that the subject does not possess a certain qualifying feature. Quantity is a term applied to judgments to express the universality or particularity or singularity of judgment (q.v. for the distinction between singularity, particularity, and universality).

Traditional logic has scarcely so much as recognized the distinction between singularity and universality, much less has it done any justice to the distinction. It took a proposition and divided it into three parts—subject, predicate, and copula. (See JUDGMENT, for definition of these terms.) The subject, in this scheme, was the term, either connotative or nonconnotative, which denoted the logical subject; but from the logical subject was excluded all consideration of logical quantity. Hence provision had to be made for logical quantity elsewhere, and it was made very mechanically. The subject was regarded as either a single object or as single mutually independent objects, of which there was a fixed number. Now, the question was whether the predicate was affirmed (or denied) of every one of these objects or only of a part of them. In the former case the judgment was considered universal; in the latter, particular. Now, if the subject was only one object, then the predicate was considered as true of the whole subject, and therefore the judgment was in this case regarded as universal. Hence it came about that two so very different judgments as "Garfield died of an assassin's bullet" and "All men are mortal" were both regarded as universal, because, just as in the latter the speaker means men without exception, so in the former he means Garfield without exception. Following this artificial method of identifying singular and universal judgments, logical quantity is regarded as either particular or universal. Now, as there are two possible quantities, particular and universal, and two possible qualities, affirmative and negative, there are, quantity and quality considered together, four possible kinds of judgments: (1) universal affirmative, symbolized by A; (2) universal negative, E; (3) particular affirmative, I; and (4) particular negative, O. The symbols, A, E, I, O, came down to us from Latin logicians, who took the first two vowels of the verb *affirmo*, I affirm, to symbolize the two classes of affirmative judgment, viz., the universal affirmative and the particular affirmative respectively, and the two vowels of the verb, *nego*, I deny, to symbolize the two corresponding classes of negative judgments, in each case giving precedence to the universal judgment. These symbols form the basis of the nonsense names (*Barbara*, *Celarent*, etc.) given in traditional logic to the moods of the syllogism (q.v.). This same traditional logic divides inference (q.v.) into two kinds—direct or immediate, and indirect or mediate. Direct inference is any method of transforming a given single judgment into (apparently) another judgment equally true, or into a judgment known to be false if the given judgment is true, or vice versa. Indirect or mediate inference is a syllogism (q.v.). True scientific induction had originally no place in this scheme, and even now a place can be found for it only by considering induction as a species of syllogism. Direct or immediate inference was divided into inference by opposition (q.v.), conversion (q.v.), obversion (q.v.), and contraposition. See CONVERSION.

Of recent years attempts have been made to reduce logic to a mathematical discipline. George Boole in his works, *The Mathematical Analysis of Thought* (Cambridge, 1847) and *An Analysis of the Laws of Thought* (London, 1854), promulgated the theory that judgments are equations. Jevons, De Morgan, C. S. Pierce, E. Schroeder, and Couturat have carried this algebraic treatment of logic out in great detail, and some of them at least claim that there is no really scientific logic except of this algorismic sort. But they have not succeeded in converting all logicians to their way of thinking. The tendency has been to consider logic as an independent science which can only in a very artificial and inadequate way be reduced to algebraic expression.

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LOGIER, lō′zhyā′, JOHANN BERNHARD (1777–1846). A German-English musician and inventor, born at Cassel, Germany. He was of a musical family, and when, at 10 years of age, he was taken to England he studied the flute and piano, and subsequently became flutist in the band of an Irish regiment. When it was disbanded he obtained the post of organist at Westport, Ireland. He now invented the chiroplast, an apparatus designed to help beginners to acquire the correct position in playing the piano. Both this contrivance and a new system of instruction, by which Logier had several pupils play at once on separate instruments, aroused widespread interest and controversy. Their inventor was quick to take advantage of the notoriety and soon acquired a fortune. In 1821 the Prussian government invited him, to Berlin to teach his system, and he remained there for three years. In 1826 he gave up teaching and settled near Dublin. His compositions, largely for the piano, are unimportant, but his *Practical Thoroughbass* (1818) was for almost half a century a standard work.

LOGIS′TICS (Gk. *λογιστική* [sc. *τέχνη*], *logistikē* [sc. *technē*], art of calculation, from *λογιστής*, *logistēs*, calculator, from *λογίζεσθαι*, *logizesthai*, to compute, from *λόγὸς*, *logos*, speech, word, reason). In military science, the branch which deals with all estimates for supplies of ammunition and transportation. It is one of the most important details of general staff (q.v.) duties in connection with an army in the field, because of its special reference to all matters affecting the arranging and timing of concentration or other marches and the direction of transportation, etc. It is a leading factor in the art of strategy so far as its provisions are concerned, and with tactics in respect to the actual carrying out of prearranged plans.

LOGISTIC SPIRAL. See LOGARITHMIC SPIRAL.

LOG′OGRAM (Gk. *λόγος*, *logos*, word + *γράμμα*, *gramma*, letter). An abbreviation, or other sign, which stands for a word, e.g., Dr. (for doctor) or $ (for dollars). It is also a name for a complicated or multiplied form of the anagram (q.v.), where the puzzle maker, instead of contenting himself with the formation of a single new word or sentence out of the old by the transposition of the letters, endeavors to discover all the words that may be extracted from the whole or from any portion of the letters, and throws the whole into a series of verses in which synonymous expressions for these words must be used. The puzzle lies in ascertaining what the concealed words are and, through them, what is the primary word out of which they have all been extracted.

LOGOG′RAPHERS (Gk. *λογογράφος*, *logographos*, historian, from *λόγος*, *logos*, word, story + *γράφειν*, *graphein*, to write). 1. The name by which the Greek historians previous to Herodotus (q.v.) are designated. The logographers, chiefly Ionian, described in prose the mythological subjects and traditions which had been treated by the epic poets, supplementing them by material derived from family traditions and those dealing with the founding of cities, so as to form, at least in appearance, a connected history; their works, however, were wholly uncritical. The principal logographers were Hecatæus of Miletus; Acusilaus of Argos, who made a prose paraphrase of the genealogical works of Hesiod; Charon of Lampsacus; Hellanicus of Mytilene; and Xanthus of Sardis, whose history of Lydia was much used by Nicolaus of Damascus. The fragments are published, with prolegomena, translations, and notes in Latin by Mueller, *Fragmenta Historicorum Græcorum* (1856). 2. The term is often applied also to those Greek (Athenian) orators who composed and sold judicial speeches or pleadings, in evasion of the law which forbade litigants to employ advocates and required them to speak for themselves in court. (See ISOCRATES; LYSIAS.) Consult J. B. Bury, *The Ancient Greek Historians* (New York, 1909), and Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1909).

LOG′OMA′NIA (Neo-Lat., from Gk. *λόγος*, *logos*, word + *μανία*, *mania*, madness). A word used vaguely to describe confusion of terms, speech disturbances, and even aphasia occurring in delirious or insane people. Its proper definition is a mania characterized by loquacity; but the word is now obsolete.

LOG′OS (Gk. *λόγος*, *logos*, word). A term used in the Fourth Gospel to designate the divine person who became incarnate in Jesus Christ. The term was used by Heraclitus to mean the reason, the underlying principle of the universe. Plato used it, in the plural, for the invisible patterns of visible things. Philo (q.v.), combining these ideas with its literal meaning of 'word,' 'expression,' used the term in a half-personified way to mean the creative power by which God expressed himself in the created world. The author of the Fourth Gospel, writing, it would seem, for persons familiar with the general thought which Philo represented, began his Gospel with a prologue in which he claimed that this eternal Expression of God, called by philosophy the Logos, had now made a clearer expression of himself in Jesus Christ. Christ is the earthly form of the preëxistent Logos (Word) (John i. 1–14). This general idea of a preëxistent Christ in some way connected with the process of creation is found also in Colossians and Ephesians, but without the term Logos. Both Philo and John were probably influenced by Old Testament suggestions like the use of "wisdom" in Proverbs viii as a medium of God's creative power, and by the rabbinical usage of substituting "the *memra* (word) of God" in anthropomorphic expressions like "God formed man." When the early Church began to come in contact with Greek philosophy and to feel the need of explaining its faith in the divine nature of Christ, Justin Martyr and Irenæus found the conception of the Logos useful. The Greek fathers, especially Clement and Origen (qq.v.), developed a theology in which the Logos played a large part. God, being good, desired to express himself. The Logos, being the greatest of his powers or ideas, has been chosen as his expression, both in creation and, through incarnation in Christ, to men. The Logos proceeds from God as the will proceeds from the spirit, yet the procession is "an eternal generation." The Logos is subordinate to God, his first creation, through whom all other creation is formed, and through whom God is adequately revealed to man. The idea thus was, for the Greek fathers, both a philosophy of the universe and an explanation of redemption. The deeper theological question as to the relation of the Logos, the divine in Christ, to the Father was the main topic of all that series of discussions which culminated at Nicæa (325) and led to the formulation of the doctrine of the Trinity (q.v.). The Latin theology, making Christ the direct incarnation of God, has little real use for the subtler conception of the Logos, and it has become scarcely more than another term for "God in Christ." See HOLY GHOST.

Bibliography. For the Greek and Jewish ideas: Drummond, *Philo Judæus*, vol. i (London, 1888); Anathon Aall, *Geschichte der Logoslehre in der griechische Philosophie* (Leipzig, 1896); Caird, *Theology in the Greek Philosophers* (Glasgow, 1904). On the Christian ideas: I. A. Dorner, *History of Development of the Doctrine of the Person of Christ* (5 vols., New York, 1862–65); Adolf Harnack, *History of Dogma* (7 vols., Boston, 1894–99); E. F. Scott, *The Fourth Gospel* (New York, 1907); Mackintosh, *The Doctrine of the Person of Christ* (ib., 1912); Newman, "Causes of the Rise and Successes of Arianism" in *Tracts Theological and Ecclesiastical* (London, 1902); also the works of St. Augustine, passim.

LOG PERCH. The largest of the darters (see DARTERS), reaching a length of 6 to 8 inches, and readily known by its zebra-like colors. It is to be found throughout the whole interior of the United States, usually in cold, rapid streams, where it is a favorite of boyish anglers, and is always admirable for its swift, graceful movements. Local names in the Southwest are rockfish, hogfish, and hog molly. Consult Jordan and Copeland, "Johnny Darters," in *American Naturalist*, vol. x (Salem, 1876). See Plate of PERCHES.

LOGROLLING. An American political term used to denote the mutual aid of legislators in carrying out each other's individual schemes. The term applies usually to local legislation, though it may be used with equal force in national politics—as when there is an understanding between parties that certain bills shall not be opposed simply on party grounds. The term is said to be an allusion to the practice of settlers in the West assisting one another to roll logs in erecting a log house; a picnic was held and all the neighbors helped erect the house.

LOGROÑO, lô-grō′nyȯ. A city and the capital of the Province of Logroño, on the Ebro, 30 miles southeast of Vitoria (Map: Spain, D 1). It is surrounded by mediæval ramparts; has pleasant promenades and squares, the church of Santa María Palacio, founded according to tradition by Constantine the Great (? 288–337), and a bull ring accommodating 11,000 persons. As the centre of the fertile vine-growing region of Rioja, it has an important wine trade. It is the Roman *Lucronius* and *Juliobriga*. In 1521 it was unsuccessfully besieged by the French, but was held by them from 1808 to 1813. Here was born the painter Juan Fernández de Navarrete (1526–1579). Pop., 1900, 18,866; 1910, 23,926.

LOGROSCINO, lō′grȯ-shē′nȯ, NICOLO (1700–63). An Italian dramatic composer. He was born in Naples and is known to fame for his development of the opera-buffa style and his method of concluding the close of each act in ensemble, which latter innovation has been the custom ever since. His operas include: *Inganno per inganno* (1738); *La violante* (1741); *Il governatore* (1747); *Tanto bene, tanto male; Il vecchio marito; La furba burlata* (1760); and a grand opera, *Giunio Bruto* (1750). He died in Naples. Consult Herman Kretzschmar, "Zwei Opera Nicolo Logroscinos," in *Jahrbuch der Musikbibliothek Peters* (Leipzig, 1908).

LOG′WOOD′ (so called because imported in logs). The dark red solid heartwood of *Hæmatoxylon campechianum.* The tree belongs to the natural order Leguminosæ and grows in Mexico and Central America and in some of the West India islands. It is the only known species of its genus. It grows to a height of 20 to 50 feet; the leaves are paripinnate; the racemes many-flowered and longer than the leaves. The sapwood is yellowish, and, being worthless, is hewn off with the bark. The heartwood is heavier than water, close-grained, but rather coarse. It has a slight smell resembling that of violets, a sweetish taste, is astringent, and contains a distinguishing crystalline principle, called hæmatoxylin (q.v.). Logwood is imported in billets or logs, usually of very irregular shape; the color is a dark blood red, becoming almost black after long exposure. The infusion of the wood is also blood red, which color it yields readily to boiling water; it is changed to light red by acids, and to dark purple by alkalies. While all other dyewoods have been nearly superseded by the artificial colors made from coal tar, logwood is still used in large quantities, mainly for the production of blacks on silk and wool. Its use for dyeing cotton black has been largely superseded by the sulphur blacks. It is further used in the manufacture of ink, and it is employed to some extent in medicine for controlling all forms of diarrhœa. In dyeing it is used either in the form of chips or in the form of extracts. Since hæmatoxylin, the ingredient of logwood to which its value as a dyewood is due, is not in itself a coloring matter, but is capable of yielding one under appropriate treatment, the wood is often subjected to a process of curing in order to oxidize the hæmatoxylin to the dye hæmatein. This may be effected by simply moistening the chips and exposing them to the action of the air; usually, however, glue and various chemicals are added for the purpose of hastening the operation, though it is by no means certain that those substances have a beneficial effect. In recent years this curing process is being gradually discarded, partly because logwood extract is increasingly used, and also because an oxidizing agent, potassium dichromate, is now generally employed as a mordant in place of iron. This effects a change of hæmatoxylin to hæmatein. Of the varieties of logwood that occur in commerce, the best qualities come from Jamaica, Honduras, and Santo Domingo. The Campeachy supply, at one time considered the best, is now about exhausted. See Dyeing.

LÖHE, lẽ′*e*, Johann Konrad Wilhelm (1808–72). A German Lutheran clergyman and theologian, best known for his activity along the lines of practical Christianity, born at Fürth, Bavaria. He was a pupil of Krafft at Erlangen, and studied also at Berlin; in 1831 became vicar of Kirchenlamitz; and won considerable local reputation as a forceful preacher. Under suspicion of mysticism he was removed by the Church authorities from his post; but not long afterward he was appointed assistant pastor of the church of St. Egidia at Nuremberg, where his pulpit eloquence became more widely recognized. In 1837 he received appointment to the pastorate of Neudettelsau, and before long was known among Lutherans throughout the world. His philanthropies were notable. Deeply interested in the welfare of German-Americans, he assisted in founding the Missouri synod of the Lutheran church, and later organized that of Iowa. At Neudettelsau he established a school for the instruction of missionaries to Germans resident abroad. He also founded the Lutheran Society of Home Missions and numerous charitable institutions. Best among his collections of sermons are *Sieben Predigten* (1836) and *Sieben Vorträge über die Worte Jesu am Kreuze* (1859). Besides these he wrote *Samenkörner des Gebets* (36th ed., 1899); *Von der weiblichen Einfalt* (13th ed., 1903); *Drei Bücher von der Kirche* (4th ed., 1904). Consult Deinzer, *Wilhelm Löhes Leben* (3d ed., Nuremberg, 1901).

LOHENGRIN, lō′en-grĕn. The hero of a mediæval German legend. He is the son of Perceval and one of the knights of the Holy Grail. He is sent by King Arthur to the aid of Elsa, Princess of Brabant, traveling on a boat drawn by a swan. At Mainz he fights with her foe, Telramund, and after his victory marries Elsa, forbidding her to inquire his origin. On his return to Cologne from an expedition against the Saracens, Elsa disobeys his command, the swan returns, and Lohengrin departs. His history is given in a Middle High German poem of the end of the thirteenth century, ascribed to two authors and exhibiting in its two portions great differences of style and language. The poem elaborates the mention of Lohengrin in Wolfram von Eschenbach's *Parzifal*, in which the hero is called Loherangrin, i.e., Gerin de Loherain (Gerin of Lorraine), and in the fifteenth century was extended and remodeled under the name *Lorengel*. The opera *Lohengrin*, by Richard Wagner, is based on the legend. It was first produced at Weimar, Aug. 28, 1850, under the leadership of Liszt, and marks the beginning of Wagner's triumph in Germany. It was first produced in the United States on April 15, 1871 (New York).

LOHENSTEIN, lō′en-stīn, Daniel Caspar von (1635–83). A German poet, born at Nimptsch in Silesia and educated at Breslau and in the universities of Leipzig and Tübingen. On his return to Breslau, after extended travels, he soon became Imperial councilor and syndic of the city. He wrote worthless lyrics under the title *Blumen*, six tragedies, and a long, tedious novel, *Grossmütiger Feldherr Arminius* (1689–90). His works are marked by sensuality and coarse bombast. With Hofmanswaldau he headed the second Silesian school and enjoyed a good reputation in his day. Selections may be found in the thirty-sixth volume of Kürschner, *Deutsche Nationallitteratur*, edited by Bobertag. Consult: Passow, *Lohenstein, seine Trauerspiele und seine Sprache* (Meiningen, 1852); Kerckhoff, *Lohensteins Trauerspiele* (Paderborn, 1877); Müller, *Beiträge zum Leben und Dichten Daniel Kaspar von Lohensteins* (Breslau, 1882).

LÖHER, lẽ′ẽr, Franz von (1818–92). A German historian. He was born at Paderborn and, after studying at several German universities, traveled in Europe and in 1846–47 visited Canada and the United States. In 1848 he established the *Westfälische Zeitung* at Paderborn. For participation in the political agitations of the time he was imprisoned by the Prussian government, but afterward was acquitted. In 1853 he was made professor in the University of Göttingen, and in 1855 in the University of Munich. His works include: *Geschichte und Zustände der Deutschen in Amerika* (1848); *System des preussischen Landrechts* (1852); *Land und Leute in der alten und neuen Welt* (1854); *Beiträge zur Geschichte und Völkerkunde* (1885); *Kulturgeschichte der Deutschen im Mittelalter* (1891–94); and a few volumes of travel.

LOHMEYER, lō′mī′ẽr, Julius (1835–1904). A German editor and writer of juveniles, humoresques, and novels. He was born at Neisse, was educated at Breslau, and was a druggist at Elbing. He early devoted himself to political and then to juvenile writing. In 1868 he went to Berlin as a member of the staff of the political comic journal *Kladderadatsch*. In 1873 he founded the illustrated journal *Deutsche Jugend*. He was also editor of the *Deutsches Familienblatt*, and in 1901 founded the *Deutsche Monatsschrift*. His first fame came from his patriotic poems written in 1870 and 1871. His later works include: *Tierstruwelpeter* (1886); *Prinzenreise* (1888); *Kinderlieder und Reime* (1897); *Unter dem Dreizack* (1901); the comedies *Die Freunde aus der Provinz* (1883) and *Der Stammhalter* (1882); the novel *Junges Blut* (2d ed., 1883); and the poetry *Gedichte eines Optimisten* (1885) and *Flottenlieder und Seepoesien* (1900).

LÖHR, lẽr, Max Richard (1864–). A German Old Testament scholar. He was born in Stettin and studied at Königsberg and Göttingen. He became a Lutheran minister and in 1890 was assistant in the Berlin Cathedral. He was privatdocent at Königsberg in 1890–92, professor at Breslau from 1892 to 1909, associate of the German Archæological Institute in Jerusalem in 1903–04 and 1908–09, and, after 1909, professor at Königsberg. He wrote commentaries on the Lamentations of Jeremiah (2d ed., 1906) and on Samuel (1898); *Geschichte Israels* (1900); *Untersuchungen zum Buch Amos* (1901); *Alttestamentliche Religionsgeschichte* (1906); *Volksleben im Lande der Bibel* (1907); *Stellung des Weibes zu Jahve-Religion und Kult* (1908); *Einführung ins alte Testament* (1912).

LOHSE, lō′*ze*, OTTO (1859–). A German orchestral conductor, born at Dresden. At the Dresden Conservatory he studied under Draesecke (composition), Wüllner (orchestration), Richter (piano), and Grützmacher (cello). For two years (1877–79) he was a cellist in the Dresden Court Orchestra. From 1880 to 1882 he taught piano at the Imperial Music School of Wilna. From there he went to Riga as conductor of the Wagner Society, and became first conductor of the Municipal Theatre in 1889. In 1893 he returned to Germany as principal conductor of the Hamburg opera, where his wife, Madame Klafsky (q.v.), was the principal dramatic soprano. In 1895–97 he toured the United States, alternating with Mr. Damrosch as conductor of the latter's German company. From 1897 to 1904 he held the post of general musical director at Strassburg, and then went to Cologne in a similar capacity. As a guest conductor he came to be in great demand, appearing in almost all European countries.

LOIGNY, lwä′nyē′. A village of France, in the Department of Eure-et-Loir, noted as the scene of a battle, Dec. 2, 1870, in which the Germans, under the Grand Duke of Mecklenburg, won a signal victory over the left wing of the French Army of the Loire, led by General Chanzy. The German loss amounted to 4000 men and 200 officers, that of the French to 15,000, killed, wounded, and prisoners. As a result of the battle the city of Orléans fell into the hands of the Germans.

LOIR, lwär. A river of France rising in the Department of Eure-et-Loir and flowing in a generally southwesterly course to its junction with the Sarthe, a tributary of the Maine (Map: France, N., F 5). Its length is 186 miles and it is navigable by means of locks for over 70 miles.

LOIRE, lwär (Lat. *Liger*). The longest river of France (Map: France, N., E 5). It rises in the Cévennes in the Department of Ardèche at an altitude of about 4500 feet and flows in a northerly direction partly through a mountainous region to its junction with the Allier (q.v.), near Nevers, where it turns northwest and maintains that direction to Orléans. From there it flows southwest to Tours, and the rest of its course runs in a general westerly direction, emptying into the Atlantic by a wide estuary at Saint-Nazaire. Its total length is over 620 miles, and its basin occupies nearly one-fourth of the area of France. Its chief tributaries are the Allier, Cher, Indre, Vienne, and Thouet, from the left, and the Arroux and the Maine, which is formed by the union of the Sarthe and Mayenne, from the right. The estuary of the Loire from the sea to Nantes (37 miles) has been dredged to accommodate sea vessels, but above the latter port there is less navigation than formerly owing to the silting which results from the active erosion of the Loire as it traverses the marls of the Paris Basin. The melting of the snow in the mountains and rains cause a rise in the tributaries of the Loire, with the result that the main stream swells to many times its usual volume, not infrequently overflowing its banks with disastrous results. To guard against these floods, dikes were constructed along the river as early as the Middle Ages. During the summer drought it becomes a thin and feeble stream. In the first half of the nineteenth century a canal about 125 miles long was constructed along the river to provide a reservoir for the overflowing water. Canals connect the Loire with the Saône and the Seine, a canal connects Nantes with the harbor of Brest, and from Roanne to Briare the river is paralleled by a lateral canal 160 miles long.

LOIRE. A southeastern department of France, formerly part of the Province of Lyonnais (Map: France, S., J 3). Area, 1853 square miles. The basin of the Loire, which flows through this department, is meagrely productive, but the mountains along the eastern and western borders are rich in iron and lead, and the coal fields are among the richest in France. Loire is also noted for the rearing of silkworms and for the excellence of its silk manufactures. The forests yield good pine for mining timber. The weaving of hemp and flax is also largely carried on, and there are important manufactures of dyestuffs, laces, hardware, machinery, cutlery, glass, and small arms. The mineral springs of the department are in great repute, especially those of St. Alban, St. Roman du Puy, Sail-sous-Couzan, and St. Galmier. Capital, Saint-Etienne, which replaced Montbrison in 1855. Pop., 1901, 647,333; 1911, 640,549.

LOIRE, HAUTE. A department of France. See HAUTE-LOIRE.

LOIRE-INFÉRIEURE, ăɴ′fā′rê-ẽr′. A maritime department in the west of France, formerly part of south Brittany. Area, 2695 square miles (Map: France, N., D 5). The interior is, on the whole, flat, much of it boggy and traversed by the Loire. The soil is fertile, producing wheat, rye, and barley, and yields in some parts rich pasturage. There are also some fine forests. Salt marshes are numerous in the west; and south of the Loire, into which it is drained by the artificial Cheneau, is Grand Lieu, a shallow lake covering 26 square miles. The vineyards yield large quantities of wine; horse and cattle raising is a thriving business; there are good granite quarries and manufactures of iron, tobacco, sugar, and chemicals. Shipbuilding is carried on at Nantes. The coast fisheries and general export trade of the department are extensive. Capital, Nantes (q.v.). Pop., 1901, 664,971; 1911, 669,920.

LOIRET, lwä′rā′. A central department of France, formerly the east portion of the Province of Orléanais (Map: France, N., H 5). Area, 2629 square miles. The country is for the most part an elevated and fruitful plain known as the Plateau of Orléans, abounding in corn and wine. The district along both banks of the Loire, called the *Sologne*, is fertile and has many vine-clad hills capped by ruined castles. Loiret contains several large forests. There are manufactures of faïence ware, tiles, and leather. Cattle, sheep, and bees receive attention. Mineral springs are numerous. Capital, Orléans (q.v.). Pop., 1901, 366,660; 1911, 364,061.

LOIR-ET-CHER, lwär′ȧ-shâr′. A central department of France, formerly part of the old provinces of Orléanais, the Perche, and Touraine. Area, 2480 square miles (Map: France, N., G 5). The department is almost a uniform plain, partly marshy, centrally divided by the Loire, and broken only by vine-clad hills of small elevation. The northern part is watered by the Loir, a tributary of the Mayenne, and is more fertile than the south, which is traversed by the Cher. Forests cover one-sixth of the entire surface. The chief products are rye, wheat, corn, fruits, hemp, wine, and vegetables. The rearing of horses, sheep, and poultry, also beekeeping, are profitable industries. There are manufactures of woolens, cottons, leather, and glass. Capital, Blois. Pop., 1901, 275,538; 1911, 271,231.

LOISELEUR, lwäz′lẽr′, Jean Auguste Jules (1816–1900). A French publicist, historian, and miscellaneous writer, born at Orléans. He was librarian and member of the municipal council of that city and received the Legion of Honor cross in 1868. His comedy *Léonore* was produced at the Gymnase Theatre, and he published: *Les résidences royales de la Loire* (1863); *Les crimes et les peines dans l'antiquité et dans les temps modernes* (1863); *Problèmes historiques* (1867); *La doctrine secrète des Templiers* (1871); *Les points obscurs de la vie de Molière* (1877); *Nouvelles controverses sur la Saint-Barthélemy* (1881); *Trois énigmes historiques* (1882); *Molière* (1886).

LOISY, lwä′zē′, Alfred (1857–). A French exegete. He was born at Ambrières (Marne), studied at the theological seminary at Chalons, was ordained a Roman Catholic priest in 1879, and in 1881 became professor of Hebrew and biblical literature at the Institut Catholique, Paris. Removed in 1893 for his liberal views, he became lecturer at the Ecole des Hautes Etudes (Sorbonne) in 1900, but was dismissed in 1904 and in 1908 was excommunicated. In 1909 he was offered the chair of Church history at the Collège de France. Under various pseudonyms he published articles in the *Revue du clergé français* until Cardinal Richard forbade their acceptance. Loisy extends the conception of evolution to the interpretation of the Bible and even regards the Roman Catholic church as a growth and subject to further change. He became the most prominent representative of the movement called Modernism (q.v.), and the encyclicals of Pius X were directed more specifically against his works than against those of any other writer. His publications include: *Histoire du canon de l'ancien testament* (1890); *Histoire critique du texte et des versions de l'ancien testament* (2 vols., 1892–93); *Etudes bibliques* (1901); *La religion d'Israel* (1901; Eng. trans., London, 1910); *Etudes évangeliques* (1902); *L'Evangile et l'église* (1902; Eng. trans., London, 1903; new ed., New York, 1912); *Le quatrième évangile* (1903); *Autour d'un petit livre* (1903) (the last five were placed on the Index); *Les évangiles synoptiques* (1908). Consult T. A. Lacey, *Harnack and Loisy* (New York, 1904).

LOJA, lō′ʜȧ, or **LOXA.** A city of Ecuador, and capital of the Province of Loja, near the south frontier, 6900 feet above sea level (Map: Ecuador, B 4). The town lies in a beautiful valley and enjoys a moderate climate, the temperature averaging 64° F. It has a college and a cathedral; its manufactures are woolen goods. In the surrounding region cereals, tobacco, sugar cane, and cotton are produced, some stock raising is carried on, and there are mines of gold, silver, copper, and other metals. Loja was founded in 1546 by Alonso de Mercadillo. Pop. (est.), 12,000.

LOJA, or **LOXA.** A town in the Province of Granada, Spain, situated on the slope of a hill near the left bank of the Genil, 30 miles west of Granada, and on the railroad between that city and Malaga (Map: Spain, C 4). The town has several notable churches and a modern palace of the Duke of Valencia; on the summit of the hill on which the town is built are the ruins of a Moorish castle. The chief manufactures are paper and woolens. Loja was of great military importance during the wars with the Moors, being considered one of the two keys to Granada, the other being Alhama. It was captured by the Spaniards in 1486. In December, 1884, and January, 1885, it was almost destroyed by an earthquake. Pop., 1900, 19,143; 1910, 18,981.

LOKEREN, lō′kẽr-*en*. A manufacturing town in the Province of East Flanders, Belgium, on the Durme, 19 miles southwest of Antwerp (Map: Belgium, B 3). It is a well-built town, with the fine church of St. Lawrence, containing a number of paintings and a famous pulpit by Verhagen. There are manufactures of linen, cotton goods, damask, drill, chemicals, and tobacco, and it has a trade in grain, hemp, and flax. Pop., 1900, 21,057; 1910, 22,675.

LOKI, lō′kȧ (Icel., Loki). A demigod in the Scandinavian mythology. He did not belong to the race of Æsir (q.v.), but to an older dynasty. His appearance is beautiful, and he is possessed of great knowledge and cunning. He often brings the new gods into difficulties, from which, however, he again extricates them. Hence he is to be regarded as the principle of strife and disturbance in the Scandinavian mythology, mingling freely with, yet essentially opposed to, the other inhabitants of the Norse heaven, very much like the Satan of the Book of Job. By his artful malice having caused the death of Balder (q.v.), as a punishment he is tied in a cave, where a serpent spits poison on him. This, however, is caught by his wife Sigyn in a cup. When the cup is full, Sigyn empties it, and the venom drops on Loki's face, causing him to tremble in agony. Thus are produced earthquakes which frighten mortals. Loki lies in the cave till Ragnarök, and when freed he and Heimdal slay each other. He is sometimes called Asa Loki, to distinguish him from Utgarda Loki, a king of the giants, whose kingdom lies on the uttermost bounds of the earth. The devil of Christianity is sometimes called in Norway, to the present day, Laake. The giantess Angerboda bore him the three monsters, the Midgard Serpent Jörmungandr, the wolf Fenrir, and Hel, the Goddess of Death. See Fenrir.

LOKMAN, lŏk-män′ (Ar. *Lukmān*). A figure in old Arabic folklore and the supposed author of a number of Arabic fables. According to the old poets he was a wise man of the tribe of Ad, who lived as long as seven eagles or vultures. In the Koran he is mentioned as a monotheistic sage, and some of his sayings are quoted (Sura, xxxi, 11–19, from which the Sura is called the Lokman Sura). He is variously held to have been a Yemenite, a black sage of the time of David, or a near descendant of Job and living down to David's time. Derenbourg identifies him with the biblical Balaam, whose name, like that of Lokman, is connected with a root meaning 'to devour'; Sprenger, with the founder of the Elkesaite sect living near the Dead Sea. The fables that go by Lokman's name come from the Syriac versions of the Greek fables of Syntipas and Æsop and originated probably as late as the thirteenth century. They have had much vogue and have been translated into many of the languages of non-Arabic Mohammedans. The first edition, with a Latin translation by Erpenius, appeared at Leyden (1615). Recent editions are by Bernstein (Göttingen, 1817); Caussin de Perceval (Paris, 1818); Freytag (Bonn, 1823); Roediger (Halle, 1830); Rask (Copenhagen, 1831); Schier (Dresden, 1831, 1839, 1850); Delaporte (Algiers, 1835); Cherbonneau (Paris, 1847, 1883, 1888); Derenbourg (Berlin, 1850). Consult: Basset, *Loqman Berbère* (Paris, 1890); Chauvin, *Bibliographie des ouvrages arabes*, vol. iii (ib., 1898); Toy, in the *Proceedings of the American Oriental Society* (New Haven, 1887).

LOLA MONTEZ, lō′lȧ mŏn′tȧth. See MONTEZ, LOLA.

LOLIÉE, lŏ′lyā′, FRÉDÉRIC AUGUSTE (1856–1915). A French critic. Most of his writing is in the field of comparative literature. He was awarded several prizes by the French Academy, his work comprising: *Nos gens de lettres* (1887); *Le paradoxe* (1888); *Les immoraux* (1891); *Dictionnaire des écrivains et des littératures* (1897); *Histoire des littératures comparées* (1905), translated into English and Spanish; *Les femmes du second Empire* (1906), translated into English and German; *La comédie française, histoire de la maison de Molière* (1906); *La fête impériale* (1907), translated into English and German; *La vie d'une impératrice* (1908), translated into English and German; *La comtesse de Castiglione* (1912).

LOLLAND, lŏl′land. See LAALAND.

LOL′LARD (from MDutch *Lollaerd*, name of a semimonastic sect of Brabant, from *lollen*, to sing softly, to hum). 1. A name first given to a semimonastic society which arose in Antwerp and Brabant about 1300, the members of which devoted themselves to the care of the sick and burial of the dead. They are also called Alexians (from their patron, Alexius, q.v.) and Cellites. 2. The name was afterward given to those who in the fourteenth and fifteenth centuries were credited with adhering to the religious and economic views advocated by John Wiclif (q.v.). The nucleus of the Lollards was a body known as the Poor Priests, called together by Wiclif to preach a simple gospel in the smaller villages of central England and to counteract the influence of the begging friars. Oxford was the central point whence they went forth and whither they returned. The Lollards were at one time very numerous and were to be found among all classes of the population. The examinations of those who were arrested or punished as heretics after Wiclif's death in 1384 indicated their common doctrinal position. With minor differences, they agreed in condemning the use of images in the churches, pilgrimages to the tombs of the saints, the temporal lordship of the clergy, papal authority in administration, ecclesiastical decorations, the ceremony of the mass, the doctrine of transubstantiation, the waging of war, and the infliction of capital punishment. Lollardy was by no means confined to the southern portion of the British Isles, but penetrated into Scotland, where it received the ancient traditions of the Culdees (q.v.). In the year 1494 Archbishop Blacader caused 20 persons to be summoned before the King (James IV) and the great council, and indictments were found on substantially the same grounds as in England, with the additions that masses cannot profit the dead and that priests may lawfully marry. Certain of the Lollards, both in England and Scotland, developed economic theories of a Socialistic nature, and this had much to do with their persecution. Lollardy persisted till the Reformation, for which movement it had done much to prepare the English people. Consult: William Stubbs, *Constitutional History of England*, vol. iii (6th ed., Oxford, 1897); Powell and Trevelyan, *The Peasants' Rising and the Lollards* (London, 1899); Mandell Creighton, *History of the Papacy*, vol. ii (ib., 1902); James Gairdner, *Lollardy and the Reformation in England*, 3 vols. (ib., 1908–11); and the works mentioned in the article on JOHN WICLIF.

LÖLLINGITE, lēl′ĭng-īt. A white, metallic iron diarsenide. See LEUCOPYRITE.

LOLOS, lō′lōz, or NESUS. A people living in large numbers in the northeast of Yunnan, the west of Szechwan, etc., in southwestern China, probably the aborigines of this portion of the country. They are the "savages" whom the Chinese found in their conquest of this territory, and Yunnan is still the least Chinese province of all. The Lolos, together with the Miaotse and cognate peoples of China, Farther India, and Tibet, represented an old, pre-Chinese population, which was formerly considered typically Mongolian or Turanian, but this view is now considered inaccurate. Physically they are described as somewhat slenderly built, with brownish rather than yellow skin, and features recalling the Caucasian rather than the Mongolian. Some have compared them to the fairer Gypsy type. Their eyes do not seem to possess the "Mongolian droop." Some of the Lolo women present the type in a delicate and rather graceful form. Some ethnologists see in the Lolos what they term a sub-Caucasian strain of blood; others would term them proto-white or pre-Caucasian. The Lolos are said to be good miners and metal smiths. With them woman has a comparatively high position, and some of the more independent tribes have even had female chiefs. They seem to be of a merry temperament and have numerous dances and songs. According to some authorities, the language of the Lolos is related to the Thai stock of Farther India. Some of them possess a mode of writing of the hieroglyphic order, while others are said to have adopted a Tibetan form. Consult: Garnier, *Voyage en Indo-Chine* (Paris, 1873); Colquhoun, *Across Chrysé* (London, 1883); Bourne, *Journey in Southwest China* (ib., 1888); Legendre, "The Lolos of Kientchang," in *Smithsonian Institution, Report* (Washington, 1911).

LO′MAX, JOHN AVERY (1872–). An American folklorist, born at Goodman, Holmes Co., Miss. He was educated at the University of Texas (A.B., 1891) and studied at Harvard and at the University of Chicago. For seven years he taught English at the Agricultural and Mechanical College of Texas and in 1910 was appointed secretary of the University of Texas. He served as president of the American Folk Lore Society for two years and became known as a lecturer on American folk songs. Besides contributions to folklore journals, he edited *Cowboy Songs and Other Frontier Ballads* (1910), a collection of the songs that sprang up among the pioneers in the western United States, and published *Plantation Songs of the Negro* (1916).

LO′MAX, Lunsford Lindsay (1835–1913). A distinguished American soldier in the Confederate army. He was born at Newport, R. I., and after graduation from the United States Military Academy in 1856 was assigned to the Second Cavalry. He resigned from the United States Army on April 25, 1861, and was at once made a captain in the Virginia State forces. He served on the staff of Gen. Joseph E. Johnston as assistant adjutant general, and as inspector general on the staffs of General McCulloch and General Van Dorn. In 1862 he was made inspector general of the Army of East Tennessee. After much active service in the West, he was made a colonel of the Eleventh Virginia Cavalry in 1863 and participated in the Pennsylvania campaign. In 1863 he was promoted to the rank of brigadier general and was given command of a brigade of Virginia and Maryland cavalry which did effective work in the operations of General Fitzhugh Lee's division. He was made a major general in 1864 and rendered distinguished service in the Valley campaign under General Early. In 1865 he was given full command of the Valley District of the Department of Northern Virginia.

LOM′BARD. A name formerly employed in England to designate a banker or money lender. The great bankers of the Middle Ages were Italian merchants who came principally from the cities of Lombardy and settled in London, Paris, and other large cities of northern Europe. Lombard Street in London became a great financial centre, and finally the name Lombard meant money lender and usurer. See Pawnbroking.

LOMBARD, lôm′bȧrt, Johann Wilhelm (1767–1812). A Prussian Minister of State, born in Berlin of a Huguenot refugee family. He was secretary of the cabinet in 1786 and was sent on an important mission with Count Lusi in 1790. After the death of Frederick William II Lombard lost influence with Frederick William III, but in 1800 was restored to favor, and from that time on was foremost in the defense of the royal policy of friendly neutrality to France. In 1803 he met Napoleon near Brussels. The ill success of his policy increased the natural opposition to it, and most of the blame of Jena (q.v.) came to Lombard. Imprisoned by order of the Queen on the charge of treacherous correspondence with France, he was set at liberty by the King and rewarded with the post of secretary of the Academy. Besides a history of the Prussian campaign of 1787 in the Netherlands (1790), Lombard wrote, in defense of his foreign policy, *Matériaux pour servir à l'histoire des années 1805, 1806, 1807* (1808).

LOMBARD, lŏm′bärd, *Fr. pron.* lôɴ′bär′, Lambert (1505–66). A Flemish painter, erroneously called Suavis, Sustermann, and Sustris. He was born at Liége and studied under Arnold de Beer and perhaps under Mabuse. In Rome, whither he accompanied Cardinal Pole in 1537, he was much influenced by the works of Raphael and Titian and especially by those of Bandinelli and Mantegna. On his return to Liége he opened a school which was largely attended and through the agency of which his style was further diffused in the Netherlands. Among his pupils were Frans Floris, Hubert Goltzius, Willem Key, and others of equal reputation. His pictures are now very rare and difficult to identify. Two of the most important are "Sacrifice of the Paschal Lamb" and "The Last Supper," in the Liége Museum. Others attributed to him are a "Descent from the Cross," in the National Gallery, London; "Last Supper" (1531), in the Brussels Museum; a "Madonna," in the Berlin Museum; and "Adoration of the Shepherds," in the Vienna Museum. He was proficient also in architecture, numismatics, archæology, and poetry.

LOMBARD, Peter. See Peter Lombard.

LOMBARDI, lôm-bär′dê. The name of a family of architects and sculptors who emigrated about 1450 from Carona in Lombardy to Venice, where they were engaged in many important works. Four generations of this family, whose real surname was Solare, are known to have worked in Venice; but their personal history is obscure, and of two of them, Martino Lombardo, who was the first to emigrate to Venice, and Moro, one of his sons, little is known beyond their names. To Martino are sometimes ascribed the later portions of the church of San Zaccaria at Venice. The most distinguished of the Lombardi was Martino's son, Pietro (c.1433–1515), who designed the beautiful church of Santa Maria dei Miracoli at Venice (1481) and the imposing Palazzo Vendramin-Calergi (1481), one of the noblest of Venetian palaces and the earliest in Italy to be designed with engaged columns in superposed orders. He was architect also of the tomb of Dante at Ravenna (1482); also (in collaboration with others) of the Scuola di San Marco (1485 or 1489), and of the cathedral of Cividale di Friuli (1502), of the Procurazie Vecchie (1496–1517), and of the wings of the clock tower on the Piazzo San Marco; besides other buildings in Treviso, Pavia, and Venice. He appears also to have worked on the court façades of the Doge's Palace (1498). As a sculptor, he executed, wholly or in part, many of the notable monuments in the churches of Venice. His sons Antonio and Tullio assisted him in many of his works, notably in the Scuola di San Marco, the church of San Salvatore, and the Mocenigo tomb in the church of St. John and St. Paul. Tullio was also engaged in the rebuilding of the cathedral of Cividale, and with his son Santo (or Sante), in the Scuola di San Rocco, a work in which the name of a certain Giulio Lombardo also appears (1517–27). Tullio, like Pietro, was a sculptor as well as architect; he assisted Leopardi in the monument to Andrea Vendramin, and in association with Antonio executed sculptures in the Capella del Santo at Padua (1507). The later years of Antonio's life were spent at Ferrara, where he died in 1516. To Santo is attributed the Palazzo Malipiero. Little or nothing is known of the work of Moro Lombardo.

The work of the Lombardi occupies an important place in Venetian art. It is highly decorative and marked by exuberant fancy combined with delicacy and refinement of detail. Some writers, including Ruskin, use the term Lombardic to designate the works of the Lombardi and their school. Girolamo and Alfonso Lombardo were inferior artists not related to the foregoing. Consult Temanza, *Vite dei più celebri architetti e scultori veneziani* (Venice, 1762–68); Selvatico, *Sull' architettura e sulla scultura in Venezia* (ib., 1847); J. C. Burckhardt, *Cicerone*, translated from the German by Arthur Hugh Clough (10th ed., 2 vols. in 4, Leipzig, 1909–10).

LOM′BARD LEAGUE. An alliance formed in 1167 by leading cities of northern Italy against Frederick Barbarossa and later revived against Frederick II. See Lombardy.

LOMBARDS, lŏm′bardz *or* lŭm′bardz (OF. *Lombard, Lombart*, Fr. *Lombard*, Lat. *Longobardus, Langobardus*, AS. *Langbearda*, probably Long-beards; less likely, Long-axes). A Germanic people of the age of migrations. About the second century A.D. they seem to have begun to leave their original seats on the lower Elbe, where the Romans probably first came in contact with them about the beginning of the Christian era, and to have fought their way southward and eastward till they came into close contact with the Eastern Roman Empire on the Danube, towards the end of the fifth century. They adopted an Arian form of Christianity and, after having been for some time tributary to the Heruli, rose to independent power about the beginning of the sixth century, becoming masters of Pannonia, and one of the most wealthy and powerful nations in that part of the world. Under their King, Alboin (q.v.), they invaded and conquered the north and centre of Italy (568–572). The more complete triumph of the Lombards was promoted by the accession of strength which they received from other tribes following them over the Alps—Bulgarians, Sarmatians, Pannonians, Norici, Alemanni, Suevi, Gepidæ, and Saxons—for the numbers of the Lombards themselves were never very great.

Except where there was immediate need of united action the Lombards were generally divided into little bands, each under a so-called duke, who endeavored to secure an independent principality for himself. The various dukes overran almost all of Italy except a few fortified towns. Alboin was succeeded about 573 by Cleph, whose reign and the following 10 years were a period of unbroken anarchy. Authari (584–590), who assumed the title of Flavius, which had been borne by some of the later Roman emperors, asserted the usual claims of a Roman ruler. The administration of the Lombard Kingdom was soon superior to that which then prevailed in other parts of Italy. While the higher nobility, however, in general retained some portion of their former wealth and greatness, the possessors of small properties became fewer in number and sank into the class of mere cultivators. The rights of the municipal corporations, although acknowledged, were gradually abridged, partly through the encroachment of the Lombard dukes and partly through those of the higher clergy, till few relics of their ancient self-government remained.

The conversion of the Arian Lombards to the orthodox faith was brought about by the policy of Gregory the Great and by the zeal of Theudelinda, wife of Authari, and subsequently of his successor, Agilulf (590–615). Theudelinda persuaded Agilulf to restore a portion of their property and dignities to the Catholic clergy and to have his own son baptized according to the Catholic rites. She also built a chapel at Monza, near Milan, in which in subsequent times was kept the Lombard crown, called the *Iron Crown*. The Lombards were gradually converted to the Roman Catholic faith. The contests of the dukes prevented the firm consolidation of the Kingdom, or any very considerable extension of its boundaries. The edict of the Lombard King Rothari (636–652), declaring the laws of the Lombards, promulgated in 643, is memorable. It was revised and extended by subsequent Lombard kings and remained in force for several centuries after the Lombard Kingdom had passed away. The Lombards gradually became assimilated with the former inhabitants of the land, their rude customs began to assume something of refinement, and the Latin language prevailed over the German. Of this original Lombard language little is known, nothing remaining to attest its German character except a few words and names, the very ballads in which the stories of Lombard heroes were recorded having come down to us in Latin versions.

Liutprand (712–744) raised the Lombard Kingdom to its highest prosperity. He quelled with a strong hand the turbulence of the nobles and sought to extend his dominion over all Italy. King Aistulf (749–756) gave a finishing blow to the Exarchate of Ravenna. (See Ravenna, Exarchate of.) But the efforts of the popes and the disputes which arose concerning the succession to the Lombard throne led to the downfall of the Lombard Kingdom within a short time after. The popes allied themselves with the Frankish kings, and Pepin the Short, in gratitude for the Pope's sanction of his act in dethroning the Merovingian King and making himself ruler, invaded Italy in 754 and 756, and compelled King Aistulf to refrain from further conquests and even to give up some of the cities which had already yielded to his arms; these Pepin bestowed upon the Church. New causes of hostility between the Frankish and the Lombard monarchs arose when Charles the Great sent back his wife, the daughter of the Lombard King Desiderius (c.757–774), to her father, whereupon Desiderius embraced the cause of the children of Carloman, Charles's brother, against the King. In the autumn of 773 Charles invaded Italy; and in June of the following year Pavia was conquered, and the Lombard Kingdom was overthrown. In 775 an insurrection of some of the Lombard dukes brought Charles again into Italy, and the dukedoms were broken up into counties, and the Lombard system, as far as possible, was supplanted by that of the Franks. The independent Lombard Duchy of Benevento survived the overthrow of the Lombard Kingdom. Consult: Thomas Hodgkin, "Lombard Invasion and the Lombard Kingdom," in *Italy and her Invaders*, vols. v–vi (Oxford, 1895); Paulus Diaconus, *History of the Langobards*, translated by Foulke (New York, 1907); Blasel, *Die Wanderzüge der Langobarden* (Breslau, 1909); *Cambridge Medieval History*, vol. ii (New York, 1913).

LOM′BARD STYLE. The style which was used by the Lombard invaders and colonists of the north of Italy from the seventh century till it was superseded by the importation of the Pointed style from France in the beginning of the thirteenth century. It is, like the Norman (q.v.), a special national phase of the general style called Romanesque (q.v.). It prevailed not merely in Lombardy, but in other parts of Italy partly colonized by the Lombards or influenced by them, especially in southern parts, such as Apulia. The architecture is heavy in proportions and detail, sombre in general effect, using usually local stone and sometimes brick, with terra cotta in many late examples, contributing more than any other Italian school to the use of vaulting in church interiors. Milan and Pavia were the centre of one branch of the school; Parma, Piacenza, and Modena of a second; Verona of a third; Como of a fourth; while such cities as Bologna, Crema, Cremona, Novara, Brescia, and Bergamo show local variation of the Milanese variety. The style is good in construction and composition, but is deficient in architectural detail and decoration, except in the Apulian branch, which is exceedingly rich. In Apulia the cities of Bari, Bitonto, Biteto, and Altamura contain the most important churches. Sculpture, though exceedingly crude in the Milanese-Paduan school, was fairly good and abundant in the Veronese and Parmese branches, as well as in Apulia, but painting was neither a favorite nor a well-executed form of Lombard art, in comparison with the Tuscan, Roman, and Southern schools of Italian art. The Lombards had no color sense. The term is also sometimes misapplied to the work and style of the Lombardi (q.v.). See LOMBARDY, RENAISSANCE ARCHITECTURE OF.

Bibliography. The largest work on the subject is M. F. Dartein, *Architecture lombarde* (Paris, 1865–82), though this can be supplemented by Gruner, *Terracotta Architecture of North Italy* (London, 1867), by Street, *Brick and Marble in the North of Italy* (ib., 1874), by Charles Cummings, *A History of Italian Architecture from Constantine to the Renaissance* (2 vols., Boston, 1901), and by G. T. Rivoira, *Lombardic Architecture*, translated by G. McN. Rushforth (2 vols., London, 1910). The industrial arts are described in Baron de Bays, *Industrie longobarde* (Paris, 1888), and in Mayer, *Lombardische Denkmäler des 14. Jahrhunderts* (Stuttgart, 1893).

LOMBARDY, lŏm′bar-dĭ *or* lŭm′-. The historic name of that part of northern Italy which is now a compartimento comprising the provinces of Bergamo, Brescia, Como, Cremona, Mantua, Milan, Pavia, and Sondrio (Map: Italy, B 2). It lies mainly north of the Po, between Piedmont on the west and Venetia on the east, and embraces the valleys of the Ticino, Adda, Oglio, and Mincio rivers. Lombardy is in great part a fertile plain, splendidly irrigated, and yielding bountiful crops of maize, wheat, and rice. The northern part is occupied by the Alps. Wholly or partly within Lombardy are the majority of the famous Italian lakes; on the borders of Piedmont is Lago Maggiore and on the Venetian borders is Lago di Garda. Lombardy produces immense quantities of silk, and is noted for its cheese. Wine is extensively produced. Lombardy is industrially the most important region of Italy. According to the censuses of 1901 and 1911 respectively the legal population was 4,334,099 and 4,908,494; de facto population, 4,282,728 and 4,790,473. The following table shows the area of the provinces and their de facto population in 1901 and 1911; also the de facto population of the provincial capital cities (communes) bearing the same names as the provinces.

PROVINCE	Square miles	Population, 1901	Population, 1911	Population, capitals, 1911
Bergamo...	1,065	459,594	511,237	55,306
Brescia.....	1,807	538,427	596,411	83,338
Como......	1,105	580,214	616,212	44,132
Cremona...	678	327,838	348,749	40,436
Mantua....	903	311,942	349,048	32,657
Milan......	1,221	1,442,179	1,726,548	599,200
Pavia......	1,288	496,969	512,340	39,898
Sondrio....	1,232	125,565	129,928	9,117
Lombardy..	9,299	4,282,728	4,790,473	.....

The only city (commune), besides the capitals named above, with over 30,000 inhabitants in 1911 was Monza, with a population of 53,214.

Lombardy has its name from the Lombards, who occupied the region in the second half of the sixth century. (See LOMBARDS.) In 774 Charles the Great, King of the Franks, put an end to the Lombard Kingdom. After the dissolution of the Carolingian Empire and the rise of the new German Roman Empire, Lombardy, with a great part of Italy, was held in a nominal feudal subjection to the emperors, and those of the Saxon and succeeding houses came down at intervals and held diets in the plains of Roncaglia. In the development of industrial cities in Italy which was so remarkable a feature of the centuries from the tenth to the twelfth, Lombardy took a leading place, and a strong spirit of independence arose in the rich and prosperous commonwealths, of which Milan and Pavia were the most notable. A league of the Lombard cities, formed in 1167, was strong enough to oppose the Emperor Frederick Barbarossa (see FREDERICK I), to defeat him at Legnano (1176), and to wrest from him in the Peace of Constance (1183) numerous chartered privileges. This peace granted such a measure of autonomy to the cities as to make the League, which was officially recognized, virtually a republic, recognizing the nominal suzerainty of the Emperor. Jealousy among the cities of the League prevented their utilizing this opportunity for the creation of a strong federal state. The League soon fell apart. It was revived in 1226 to resist Frederick II (q.v.), but this resulted in prolonged dissension and civil war. In the thirteenth century, well characterized as the Age of Despots, the Lombard cities began to fall under the rule of tyrants. Early in the fourteenth century the house of Visconti became paramount in Milan. The Emperor Henry VII went down into Italy and was crowned with the iron crown at Milan in 1310. In the warfare of the petty states which characterized the Italy of the Renaissance the Lombard cities and principalities had their full share, and they suffered from the marauding of the Free Companies that were turned loose upon Italy by this irregular strife. In 1395 Milan, with its extensive territory, was erected into a duchy for the Visconti, who in 1447 were succeeded by the house of Sforza. France, under Louis XII (1498–1515) and Francis I (1515–47), attempted ineffectually to achieve the conquest of Milan, which was repeatedly won and lost. On the extinction of the Sforza dynasty in 1535, the Emperor Charles V took possession of the duchy, which was united with the crown of Spain. In the War of the Spanish Succession (1701–14) Austria wrested the Duchy of Milan from Spain, and simultaneously took possession of the Duchy of Mantua, whose dynasty, the house of Gonzaga, had become extinct (1708). Bonaparte in 1796–97 overran Lombardy and erected there the Cisalpine Republic. The country was lost by the French in 1799, but was recovered in the memorable campaign of 1800 and held until 1814. In 1805 Napoleon had himself crowned with the iron crown as King of Italy. The Congress of Vienna (q.v.) made Lombardy, as well as Venetia, an Austrian province, as compensation for Belgium. The two provinces were constituted the Lombardo-Venetian Kingdom (1815). They were given separate administrations, that of Lombardy being centralized at Milan, but one of the Austrian archdukes was made Viceroy of both. The repressive Austrian system of unchecked absolutism, maintained by a secret police, reduced Lombardy to the level of a conquered territory. The revolutionary year 1848 brought with it the inevitable revolt against these intolerable conditions, and Charles Albert (q.v.), King of Sardinia, came to the aid of Lombardy. His efforts to secure the liberation of Italy ended in disaster. (See ITALY.) The defeat of Novara (March, 1849) put an end to the hope of liberation for 10 years, during which the Austrian yoke again rested heavily upon Lombardy. In 1859 the statesmanship of Cavour effected that combination whose first result was to wrest Lombardy from Austria. The campaign of the allied French and Sardinian armies against Austria was decided by their victories at Magenta and Solferino (June, 1859). By the Treaty of Zurich, concluded in November, 1859, Lombardy passed from Austria to Sardinia, and in 1861 it became part of the new Kingdom of Italy.

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LOMBARDY, RENAISSANCE ARCHITECTURE OF. The Renaissance style appears to have been brought into Lombardy about the middle of the fifteenth century by various artists from Florence, Urbino, and other places south of Lombardy, chief among whom were Antonio Averulino, known as Filarete, Donato d'Urbino (known as Bramante), Michelozzo and Alberti, of Florence. Filarete was cathedral architect in Milan in 1452–54 and there in 1457 laid the first stone of his master work, the Great Hospital (Ospedale Maggiore); and began in 1457 also the cathedral of Bergamo. About the same time Michelozzo, of Florence, built the Portinari chapel of San Eustorgio at Milan, in the new style. Bramante, between 1472 and 1498, built in Milan a continuation of Filarete's Great Hospital, the transept and sacristy of San Satiro, the lower part of the transept and choir of Santa Maria della Grazie and its sacristy; near Milan the façade of Abbiate Grasso; at Como the nave of the cathedral; and to him is also ascribed the cathedral of Pavia. Alberti had meanwhile planned, and shortly before his death in 1472 begun, the great Renaissance church of San Andrea at Mantua.

This was the period of the rule of the Sforzas in Milan and Pavia, and of the Gonzagas at Mantua, under whom the arts were liberally encouraged, and at Pavia especially a long list of native Lombard artists were employed on the magnificent façade of the Carthusian church (La Certosa), begun in 1396 as a Gothic church, but left with an unfinished front until 1473, when Borgognone began the present façade. Omodeo, who was employed on this work, built also at Bergamo the beautiful Colleoni chapel of Santa Maria Maggiore. A few years later the highly ornate church of Santa Maria dei Miracoli at Brescia, by unknown architects, and the Palazzo Comunale in the same city, by Formentone of Vicenza, and others (about 1489), carried the style to the eastern boundary of Lombardy.

Meanwhile a Lombard family, the Solari, had established the style in Venice, so that the early Renaissance style in that city is sometimes known as the Lombardic or Lombardesque style. (See LOMBARDI.) Some of the other conspicuous monuments of the early Renaissance in this province are the Besta palace at Teglio; the court of the Stanga palace at Cremona; the cathedrals of Como and Bergamo; the interesting brick and terra-cotta façades of San Pietro at Modena, of the church of the Madonna della Campagna and of the Palazzo dei Tribunali at Piacenza; the Vezzani Pratonieri palace at Reggio; and many others. The Middle or High and the Late Renaissance of the sixteenth century produced fewer works than the earlier period; but among these such master works as the Palazzo del Tè and the Grand Duke's palace at Mantua, with magnificent frescoes and stucco enrichments by Giulio Romano and his school, the Brera palace at Milan, the great church of San Domenico at Bologna, and the cathedral of Brescia take high rank.

The style of the Lombard works of the early Renaissance is more ornate, less reserved and majestic and large in scale than that of the Tuscan or Roman school. This may in part be due to the widely prevalent use of brick and terra cotta, for which the abundance of excellent clay in Lombardy furnished every advantage. It was at its best between 1472 and 1500. See LOMBARD STYLE.

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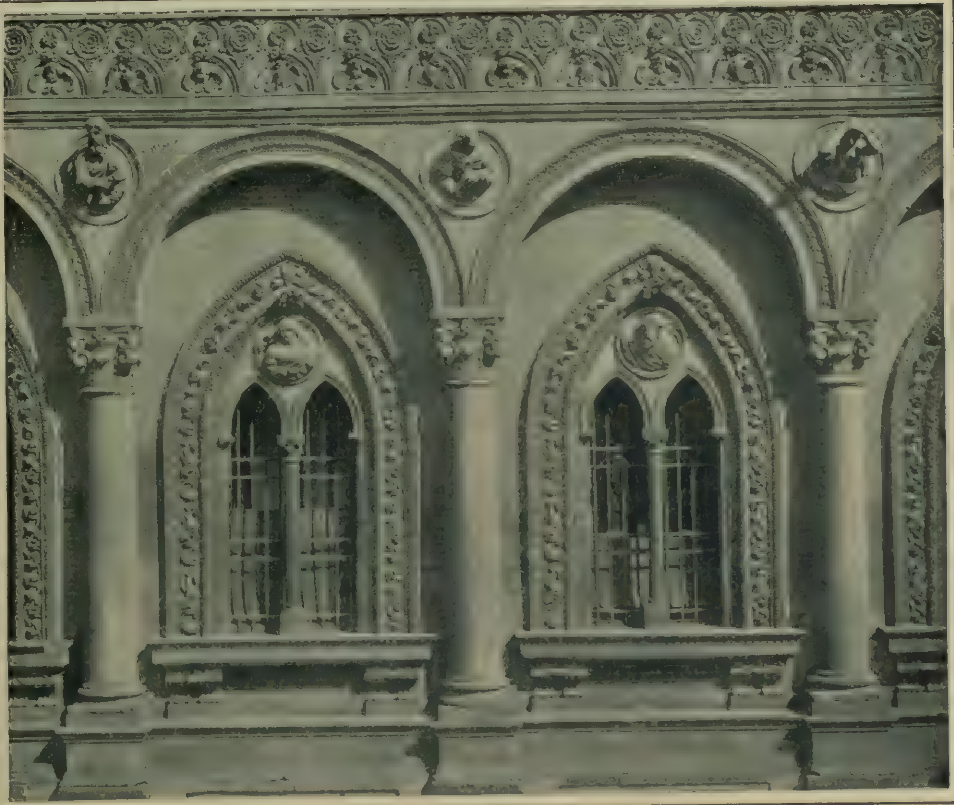
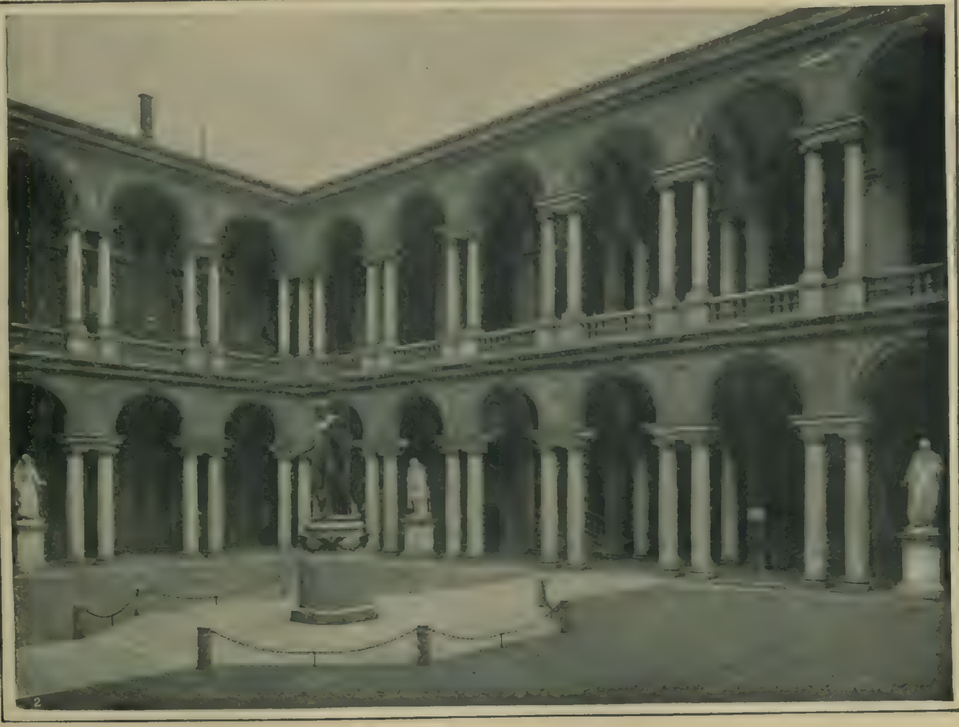
LOMBOK, lŏm-bŏk′. One of the Sunda Islands, Dutch East Indies, situated between the islands of Bali and Sumbawa, in lat. 8° 12′ to 9° 1′ S. and long. 115° 44′ to 116° 40′ E. (Map: Australasia, D 3). Its area is estimated at about 3060 square miles. The island is of volcanic origin and mountainous, rising in its highest peak to an altitude of nearly 12,000 feet. The coasts are well indented and form several good harbors. The soil in the valleys is fertile, producing good crops of rice, corn, tobacco, sugar, indigo, and coffee. Stock raising is also

LOMBARDY—RENAISSANCE ARCHITECTURE





1. DETAIL OF THE OSPEDALE MAGGIORE, MILAN. EARLY RENAISSANCE
2. COURTYARD OF THE PALAZZO DI BRERA, MILAN. HIGH RENAISSANCE

well developed, buffaloes, cattle, and horses being exported to a considerable extent. Lombok forms, together with Bali, a residency of the Dutch East Indies. The population of the island was estimated in 1905 as approximately 403,530, composed chiefly of Sassaks (the aborigines), natives of Bali Island, and Malays. The chief town is Mataram, on the western coast, and the chief commercial centre, Ampanan. Since the uprising of 1894 the island has been under the direct control of the Dutch.

LOMBROSO, lôm-brō'zô, CESARE (1836–1909). A noted Italian criminologist, born at Venice. He studied literature, linguistics, and archæology, but changed his plans and became an army surgeon in 1859. In 1862 he was appointed professor of diseases of the mind at Pavia, and later took charge of the insane asylum at Pesaro, eventually becoming professor of medical law and psychiatry at Turin. The appearance of his great book, *The Criminal* (*L'uomo delinquente*), in 1875, marked the beginning of the science of criminal anthropology, and Lombroso became the head of the Italian school. Lombroso's theory holds that there is a definite criminal type, the born criminal, distinguished from other men by physical stigmata which can be easily determined, differentiated from the normal anatomically as well as psychologically. Chief among these stigmata are excessive asymmetry of the skull, small cranial capacity, abnormal features, and slight growth of the beard relative to the hair on the head. Lombroso's work has been of great influence, but the general verdict is that the criminal type has not been established. Lombroso was a constant and versatile writer. For many years he was an editor of *Archivio di psichiatria antropologia criminale e scienze penali.* Among his works are: *Ricerche sul cretinismo in Lombardia* (1859); *Genio e follia* (1864); *Studi clinici sulle malattie mentali* (1865); *Sulla microcefalia e sul cretinismo con applicazione alla medicina legale* (1873); *L'amore nel suicidio e nel delitto* (1881); *L'uomo delinquente* (1875); *L'uomo di genio in rapporto alla psichiatria* (1889; Eng. trans., *Man of Genius,* London, 1891); *Sulla medicina legale del cadavere* (2d ed., 1890); *Palimsesti del carcere* (1891); *Trattato della pellagra* (1892); *Le più recenti scoperte ed applicazioni della psichiatria ed antropologia criminale* (1894); *L'antisemitismo e le scienze moderne* (1894); *The Female Offender,* with Ferrero (Eng. trans., New York, 1895); *Genio e degenerazione* (1897); *Les conquêtes récentes de la psychiatrie* (1898); *Le crime: causes et remèdes* (1899; Eng. trans., *Crime, its Causes and Remedies,* Boston, 1911); *Lezioni di medicina legale* (1900); *Delitti vecchi e delitti nuovi* (1902); *After Death—What?* (Eng. trans., Boston, 1909). A collection of papers on Lombroso was published under the title *L'opera di Cesare Lombroso nella scienza e nelle sue applicazioni* (Turin, 1906). Consult: Ernest Bozzano, "Cæsar Lombrozo and Supernormal Psychology," in *Annals of Psychical Science,* vol. iv (London, 1906); Hans Kurella, *Cesare Lombroso, a Modern Man of Science,* translated from the German by M. E. Paul (ib., 1911); T. L. Ferrero, *Criminal Man according to the Classification of Cesare Lombroso* (New York, 1911).

LÔME, STANISLAS CHARLES HENRI LAURENT, DUPUY DE. See DUPUY DE LÔME, S. C. H. L.

LOMÉNIE, lô'mȧ'nē', LOUIS LÉONARD DE (1815–78). A French author, born at Saint-Yrieix. He studied at Avignon and in 1845 was appointed professor of French literature at the Collège de France. His first literary work was a series of biographical sketches, published under the title *Galerie des contemporains illustres par un homme de rien* (1846–47). In 1864 he was appointed professor of French literature in the Ecole Polytechnique and became a member of the French Academy. His chief work is *Beaumarchais et son temps* (1855), marked by much scholarly research. He also wrote *La comtesse de Rochefort et ses amis* (1871); *Esquisses historiques et littéraires* (1878); *Les Mirabeau* (1879).

LOMÉNIE DE BRIENNE, de brē'ĕn', ETIENNE CHARLES DE (1727–94). A French cardinal and politician, born in Paris. He became Bishop of Condom in 1760, Archbishop of Toulouse in 1763 and of Sens in 1788, and in the latter year Cardinal. In 1770 he was elected a member of the Academy. He was friendly to the Encyclopædists, especially Turgot, and his orthodoxy was suspected by his contemporaries. He was made Comptroller General of the Finances in 1787, to succeed Calonne, and Prime Minister in 1788; proved to be unequal to the task set him; and after having become involved in contests with the Parlements and been unable to save France from grave financial difficulties, was dismissed in 1788. It was he who promised to have the States-General summoned.

LOMMEL, lôm'mel, EUGEN VON (1837–99). A German physicist, born at Edenkoben in the Palatinate. He studied mathematics and physics at the University of Munich from 1854 till 1858 and in 1860 became instructor in physics at the Cantonal School of Schwyz in Switzerland. Five years afterward he removed to Zurich, where he taught mathematics in the polytechnical school, and in 1867 returned to Germany to take a position in the agricultural academy at Hohenheim. The next year he accepted the chair of physics at the University of Erlangen, where he remained until 1886, when he was appointed to the same chair at the University of Munich, in which city he became a member of the Academy of Sciences. In 1893 he was ennobled. Among his publications are: *Studien über die besselschen Funktionen* (1868); *Wind und Wetter* (2d ed., 1880); *Das Wesen des Lichtes* (1874); *Lehrbuch der Experimentalphysik* (11th ed., 1904); *Georg Simon Ohms wissenschaftliche Leistungen* (1889), which was translated by W. Hallock under the title *The Scientific Work of George Simon Ohm* (Smithsonian Institution Report, 1891).

LOMOND, lō'mond, LOCH. The largest lake of Scotland, situated in the counties of Dumbarton and Stirling (Map: Scotland, D 3). It is about 23 miles long and its width varies from 5 miles at the south extremity to less than 1 mile at the north end. The depth varies from 20 to 600 feet. It is surrounded by mountains (one of which is Ben Lomond) and wooded hills, and is celebrated for its picturesqueness. It contains a large number of wooded islets and is navigated by steamers. The West Highland Railway runs along its shore. The outlet of the lake is the Leven, a tributary of the Clyde.

LOMONOSOV, lô-mô-nô'sôf, MIKHAIL VASILIEVITCH (1711–65). A Russian poet, philologist, and scientist. He was the son of a well-to-do fisherman of Denisovka, a village near

Archangel. In 1729 he ran away from home, went on foot to Moscow, and there entered a classical school in a monastery, where he lived in extreme want. Later he was sent to Kiev to study philosophy and the natural sciences, but was recalled to the Academic Gymnasium at St. Petersburg, and later with two other students was sent to Germany. From 1736 to 1739 he was at Marburg under the tuition of the famous mathematician and philosopher, Christian Wolff. Then for two years he studied metallurgy at Freiberg. Married to a German girl in 1740, after a number of adventures he returned to St. Petersburg in 1741 and was appointed adjunct in chemistry and physics in 1742 and professor of chemistry in 1745. As a scientist, Lomonosov rendered most significant service to Russia by persistently preaching to the enemies of light and progress the doctrine "Knowledge is power." As part of his activity in education he founded the first and still most important Russian university at Moscow. His first successful verse was his *Ode on the Capture of Khotin* (1739), which he sent from abroad, along with a *Letter on the Rules of New Russian Versification.* He left numerous odes, epigrams, dramas, etc., mostly in the pseudo-classical style prevalent at the time, though in his scientific and other writings he made very good use of the more colloquial Russian. His greatest services to Russia lie in the sphere of philology: his *Russian Grammar* (1755), an essay on *The Importance of Ecclesiastical Books for the Russian Tongue* (1755), and his *Rhetoric* (1748) established the basic principle of latter-day Russian by drawing a distinct line of demarcation between Russian and Church Slavonic. For this he is deservedly called "the father of new Russian literature." The best edition of Lomonosov's works is that of the Imperial Academy of Sciences (4 vols., St. Petersburg, 1892–98), with a commentary by the Academician Sukhomlinov. The best biography is by Pekarsky in his *History of the Academy of Sciences,* vol. ii (St. Petersburg, 1873). Two good recent studies are by P. Borzakovsky (Odessa, 1911) and by B. N. Menshutkin (St. Petersburg, 1911).

LOMZA, lŏm′zhȧ. A small government of Russian Poland, bounded on the north by Prussia; area, about 4072 square miles (Map: Russia, B 4). Its surface is mostly flat and partly marshy and to some extent covered with forests. It is watered by the Narev and the Bug and has a moderate climate. Agriculture engages the attention of most of the inhabitants, rye, oats, and wheat being the principal crops. Pop., 1897, 579,592; 1912, 694,400, composed principally of Poles and Jews.

LOMZA. The fortified capital of the government of the same name, situated on the left bank of the Narev, an affluent of the Bug, 96 miles northeast of Warsaw. It has a Gymnasium, a theatre, and government buildings. Its industrial activity is on a small scale. Pop., 1897, 22,428; 1912, 27,806, chiefly Poles and Jews. Lomza existed as early as the tenth century, and was a place of considerable commercial importance in the sixteenth century. In the European War of 1914 Lomza was the scene of a battle between the Russians and the Germans. The former were compelled to fall back on the town during a German drive on Warsaw from the north. See WAR IN EUROPE.

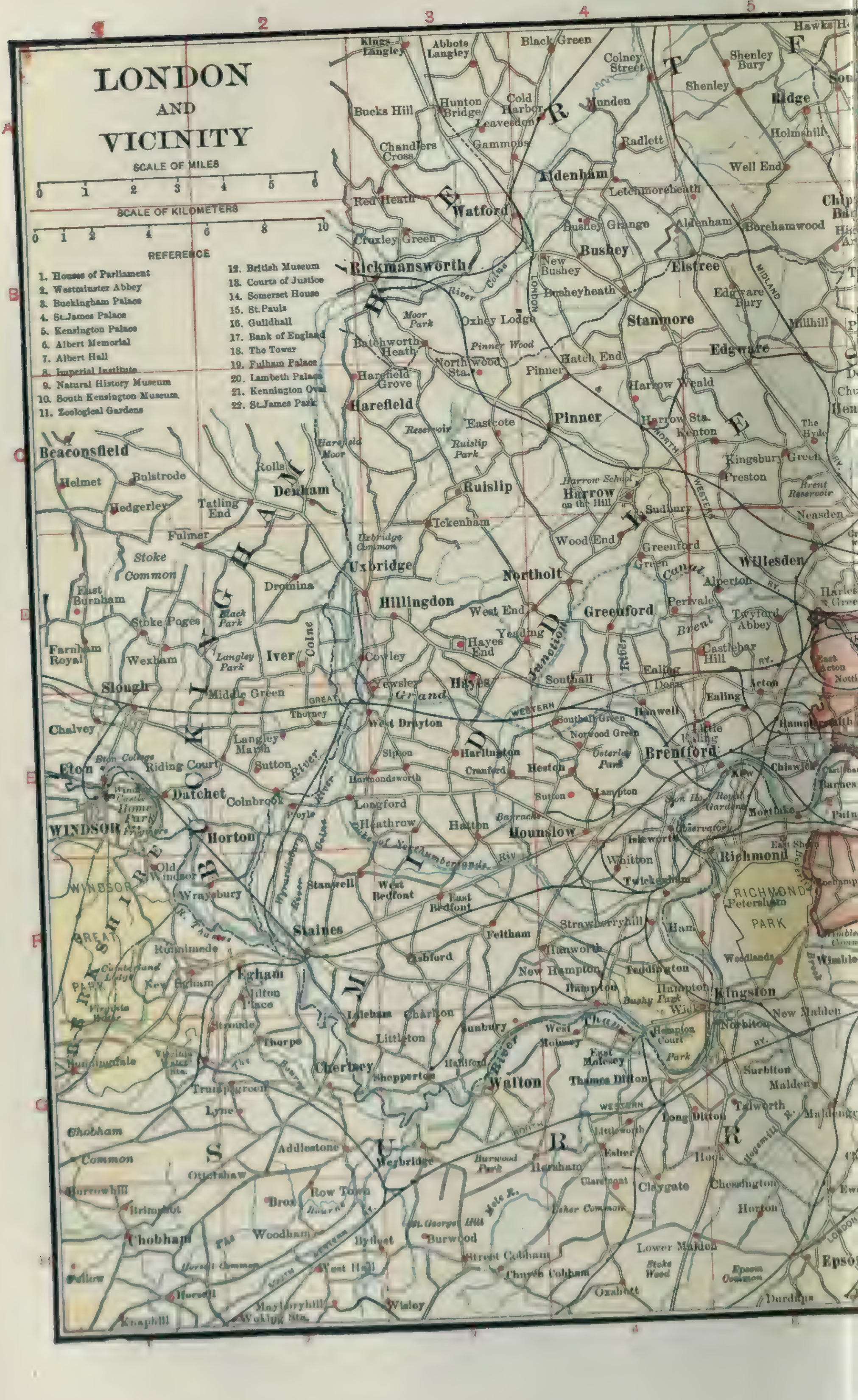
LONDIN′IUM. See LONDON.

LONDON, lŭn′don (Brit. *Lundayn,* or *Lundein;* Saxon *Lundon, Lundone,* and other forms; in Tacitus and other Latin writers, *Londinium,* and *Lundinum.* Various derivations have been assigned to the name, among which is the old British *lyn-,* lake, and *din,* town, possibly fort or landing place; "as until recent dates the south side of the river was often a lake in some parts and a swamp in others, the name might easily be changed from *Lyndin* to *London* and be descriptive of its local position"). The capital of the United Kingdom of Great Britain and Ireland, and the largest city in the world (Map: England, F 5). It is situated at the head of tidewater on the river Thames, about 60 miles from the open sea, where in the days before the Roman occupancy there was a convenient crossing place, the swamps on the south and the forests on the north being so situated as naturally to cause the northern and southern routes to converge upon this crossing, with the result that a thriving town or trading point was developed on the eminence which is now the "city." In the seventh century Westminster Abbey was built west of the "city." These two sites constitute the nucleus around which London has grown. The parallel of latitude of 51° 30′ N. bisects the city.

London occupies both banks of the Thames River about 50 miles above its estuary, the river, spanned by numerous fine bridges, flowing through the more southern part of the city with sluggish current and in long, winding reaches, its breadth being from 600 to 900 feet. Below London the land adjoining the Thames is flat, low, and marshy; and the site of the city, whose special characteristic on the left, or northern, bank of the Thames is that of a gently undulating plain, is the first upland above the estuary, and a particularly healthful and favorable position for urban development. Most of the city stands upon the sands and gravels of the Glacial period, which are underlain by the London clay that outcrops in some localities. The Fleet and all the other streams that reached the Thames within the present city limits have disappeared in the sewerage system of the metropolis.

Many factors have contributed to make the greatness of London and its supremacy in the trade of the world. In the course of some centuries, and particularly of the nineteenth century, the Thames was deepened and provided with adequate dockage, so that the port of London was made available to the largest shipping of the world. From its docks extends an unsurpassed waterway by river and sea to all the coasts of northwest and west Europe, always one of the most important elements in the trade of Great Britain. Its southerly maritime position, in the best-developed part of the British Isles, gave it the mastery both in the home and foreign trade; and from the time when Alfred the Great made London the capital of his Kingdom it became the great centre of British social and political interests. With the growth of its world-wide business relations and the greater intensity of its industrial activity, the centrifugal tendency of its population increased.

Area and Population. In 1888 London was politically restricted to the administrative county of London, made up of parts of Middlesex, Surrey, and Kent, covering an area of about 118 square miles, and for administrative purposes, besides the nucleus known as the city of London, was divided into several metropolitan


LONDON AND VICINITY

SCALE OF MILES

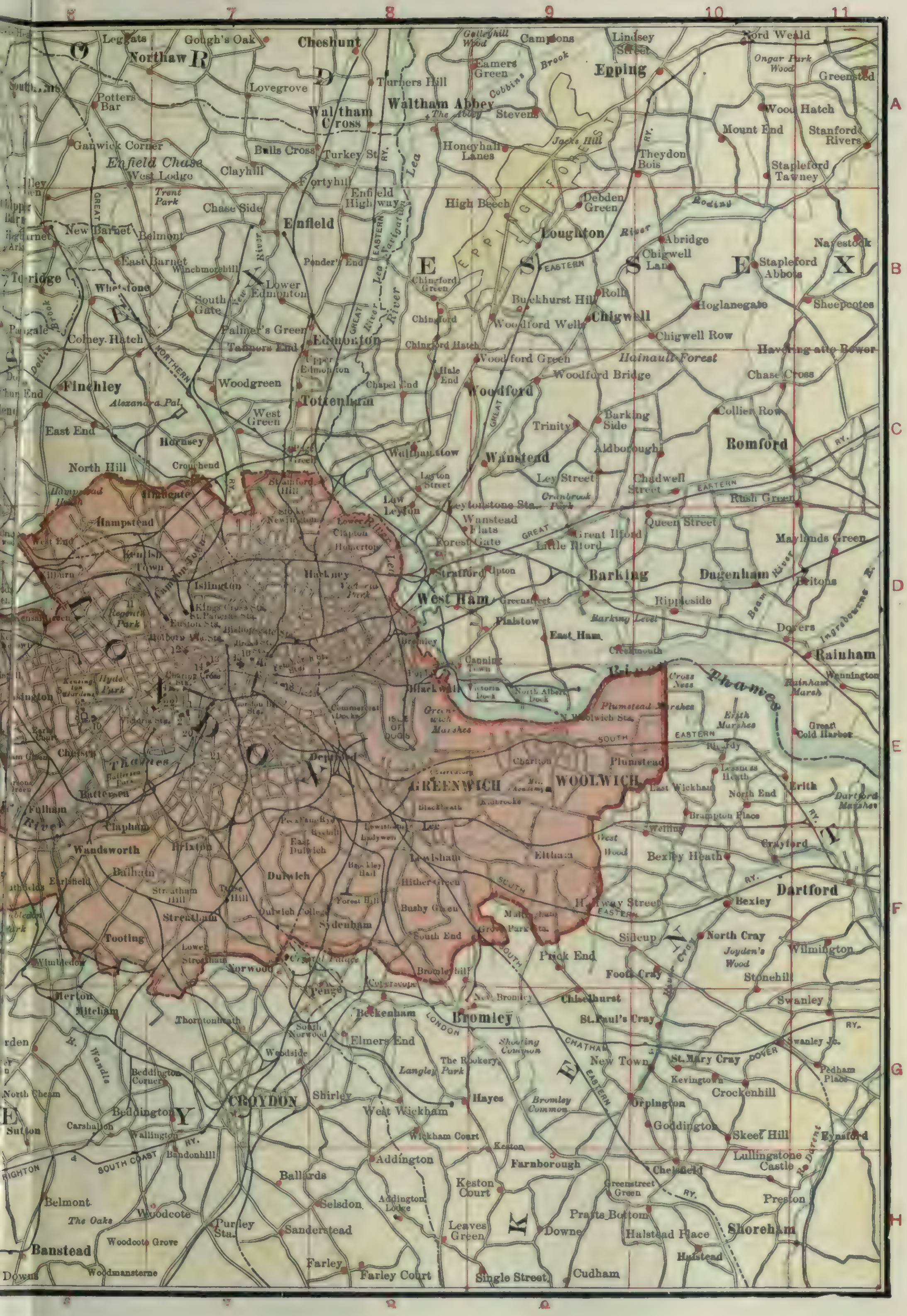
0 1 2 3 4 5 6

SCALE OF KILOMETERS

0 1 2 4 6 8 10

REFERENCE

1. Houses of Parliament
2. Westminster Abbey
3. Buckingham Palace
4. St.James Palace
5. Kensington Palace
6. Albert Memorial
7. Albert Hall
8. Imperial Institute
9. Natural History Museum
10. South Kensington Museum
11. Zoological Gardens
12. British Museum
13. Courts of Justice
14. Somerset House
15. St.Pauls
16. Guildhall
17. Bank of England
18. The Tower
19. Fulham Palace
20. Lambeth Palace
21. Kennington Oval
22. St.James Park



7
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A
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G
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MIDDLESEX
ESSEX
SURREY
KENT
LONDON
Leggats
Gough's Oak
Cheshunt
Northaw
Potters Bar
Lovegrove
Turners Hill
Waltham Abbey
Waltham Cross
The Abbey
Gallyhill Wood
Campions
Lamers Green
Cobbins Brook
Stevens
Lindsey Street
Epping
Nord Weald
Ongar Park Wood
Greensted
Wood Hatch
Mount End
Stanford Rivers
Ganwick Corner
Enfield Chase
West Lodge
Bulls Cross
Turkey St.
Clayhill
Forty hill
Enfield Highway
Honeyhall Lanes
Jacks Hill
Theydon Bois
Stapleford Tawney
Trent Park
Chase Side
Enfield
High Beech
Epping Forest
Debden Green
Loughton
River Roding
Abridge
Chigwell Lane
Navestock
Stapleford Abbots
New Barnet
Belmont
East Barnet
Winchmorehill
Pender's End
New River
Lower Edmonton
Chingford Green
Chingford
Buckhurst Hill
Rolls
Chigwell
Hoglanegate
Sheepcotes
Totteridge
Whetstone
South Gate
Palmer's Green
Tanners End
Edmonton
Upper Edmonton
Chingford Hatch
Woodford Wells
Chigwell Row
Havering atte Bower
Colney Hatch
Dollis Brook
Woodford Green
Hainault Forest
Woodford Bridge
Chase Cross
Finchley
Alexandra Pal.
Woodgreen
Chapel End
Hale End
Woodford
Tottenham
West Green
Collier Row
Barking Side
Trinity
East End
Hornsey
Aldborough
Romford
Walthamstow
Wanstead
North Hill
Crouchend
Park Green
Leyton Street
Ley Street
Chadwell Street
Hampstead Heath
Highgate
Stamford Hill
Low Leyton
Leytonstone Sta.
Cranbrook Park
Rush Green
Stoke Newington
Lower Clapton
Homerton
River Lea
Wanstead Flats
Great Ilford
Queen Street
Hampstead
West End
Kentish Town
Camden Town
Forest Gate
Little Ilford
Maylands Green
Hackney
Victoria Park
Stratford
Upton
Barking
Dagenham
Beam River
Kilburn
Islington
Kings Cross Sta.
St. Pancras Sta.
Euston Sta.
Regent's Park
West Ham
Greenstreet
Ripple side
Britons
Ingrebourne R.
Plaistow
Barking Level
Dovers
Holborn Via. Sta.
Bishopsgate Sta.
Broad St.
Bromley
East Ham
Creekmouth
Rainham
Canning Town
Wennington
Kensington Gardens
Hyde Park
Charing Cross
Poplar
Blackwall
Victoria Dock
North Albert Dock
Cross Ness
River Thames
Rainham Marsh
Kensington
London Br. Sta.
Commercial Docks
Isle of Dogs
Greenwich Marshes
Plumstead Marshes
N. Woolwich Sta.
Erith Marshes
Great Cold Harbor
Earls Court
Victoria Sta.
Deptford
Charlton
Plumstead
Belvedere
Lessness Heath
Chelsea
Battersea Park
Greenwich
Observatory
Mil. Academy
Woolwich
East Wickham
North End
Erith
Dartford Marshes
Fulham
Battersea
Blackheath
Shooters Hill
Brampton Place
Clapham
Peckham Rye
Rye Hill
Lewisham
Ladywell
Lee
Welling
Crayford
Wandsworth
Brixton
East Dulwich
West Wood
Bexley Heath
Balham
Brockley Hill
Lewisham
Eltham
Dulwich
Hither Green
Earlsfield
Streatham Hill
Tulse Hill
Forest Hill
Dartford
Halfway Street
Bexley
Streatham
Dulwich College
Bushy Green
Mottingham
Sydenham
Grove Park Sta.
Sidcup
North Cray
Tooting
South End
Joyden's Wood
Wilmington
Wimbledon
Lower Streatham
Crystal Palace
Prick End
Foots Cray
Stonehill
Norwood
Bromley hill
Cray R.
Colyers
Penge
New Bromley
Chiselhurst
Swanley
Merton
Mitcham
Thorntonheath
Beckenham
Bromley
St. Paul's Cray
Swanley Jc.
South Norwood
Elmers End
Shooting Common
New Town
St. Mary Cray
Pedham Place
Morden
R. Wandle
Woodside
The Rookery
Langley Park
Kevingtown
Beddington Corner
Crockenhill
North Cheam
Croydon
Shirley
Hayes
Bromley Common
Orpington
Beddington
West Wickham
Goddington
Skeet Hill
Eynsford
Sutton
Carshalton
Wallington
Wickham Court
Keston
Lullingstone Castle
Bandonhill
Addington
Farnborough
Chelsfield
R. Darent
Brighton & South Coast Ry.
Ballards
Keston Court
Greenstreet Green
Belmont
Selsdon
Addington Lodge
Preston
The Oaks
Woodcote
Purley Sta.
Pratts Bottom
Sanderstead
Leaves Green
Downe
Halstead Place
Shoreham
Banstead
Woodcote Grove
Halstead
Downs
Woodmansterne
Farley
Farley Court
Single Street
Cudham
Great Northern
Great Eastern Ry.
London Chatham & Dover Ry.
South Eastern Ry.

boroughs. Most of these, formerly villages and suburbs of historical interest, are treated under separate titles. Subsequently slight boundary alterations were made, so that at the 1911 census the area of the county was 116.9 square miles. Many square miles of houses had been added to the outer edge of this district; the market roads leading into the city were streets lined with houses; suburb after suburb became merged with the city by the building operations that overtook and passed beyond them. Thus, the large towns of Edmonton, Enfield, Hornsey, Tottenham, and Willesden in Middlesex, Croydon and Wimbledon in Surrey, and East and West Ham, Ilford, and Walthamstow in Essex, and scores of smaller places, practically lost their identity, because they became merely parts of the one great urban aggregate.

The City of London, the administrative county of London, and these widespreading accretions (known as the *outer ring*) form Greater London. This area, which is accurately defined by the boundaries embracing the metropolitan and City of London police districts, covers an area of 693 square miles, and had a population in 1901 of 6,581,402, and in 1911 of 7,251,358. It includes all the territory within a radius of about 14 miles from Trafalgar Square, the administrative county of London, the City of London, the whole of Middlesex, and parts of Surrey, Kent, Essex, and Hertfordshire. For the government postal and telegraphic service, the metropolitan area is divided into eight postal districts, the Eastern, Northern, North-Western, Western, South-Western, South-Eastern, East Central, and West Central, which are respectively designated by their initial letters. While extending beyond the boundaries of the administrative county of London, the postal districts do not embrace the whole area covered by the metropolitan police districts.

As in all large cities that include in their limits opportunities for further growth, a considerable percentage of the surface of Greater London is not yet utilized for streets and building sites.

The population of the area approximately equivalent to the present administrative county of London (including the City of London) was 959,310 in 1801; in 1811, 1,139,355; in 1821, 1,379,543; in 1831, 1,655,582; in 1841, 1,949,277; in 1851, 2,363,341. The following table shows the growth of population, according to the several censuses since 1861, of the administrative county of London (including the City of London), of the outer ring, and of Greater London, together with (for Greater London) the increase per cent in intercensal periods.

YEAR	Administrative county	Outer ring	Greater London	Increase per cent
1861	2,808,494	414,226	3,222,720	....
1871	3,261,396	624,245	3,885,641	20.6
1881	3,830,297	936,364	4,766,661	22.7
1891	4,227,954	1,405,852	5,633,806	18.2
1901	4,536,267	2,045,135	6,581,402	16.2
1911	4,521,685	2,729,673	7,251,358	10.2

Herewith are shown by divisions the area (in acres) and population of the administrative county of London (including the City of London) and of the outer ring according to the censuses of April 1, 1901, and April 2, 1911, and the increase (+) or the decrease (—) per cent.

	Area acres	POPULATION		
		1901	1911	Per cent
METROPOLITAN BOROUGHS				
Battersea	2,160.3	168,907	167,743	— 0.7
Bermondsey	1,499.6	130,760	125,903	— 3.7
Bethnal Green	759.3	129,680	128,183	— 1.2
Camberwell	4,480.0	259,339	261,328	+ 0.8
Chelsea	659.6	73,842	66,385	— 10.1
Deptford	1,562.7	110,398	109,496	— 0.8
Finsbury	586.6	101,463	87,923	— 13.3
Fulham	1,703.5	137,289	153,284	+ 11.7
Greenwich	3,851.7	95,770	95,968	+ 0.2
Hackney	3,287.8	219,110	222,533	+ 1.6
Hammersmith	2,286.3	112,239	121,521	+ 8.3
Hampstead	2,265.0	81,942	85,495	+ 4.3
Holborn	405.1	59,405	49,357	— 16.9
Islington	3,091.5	334,991	327,403	— 2.3
Kensington	2,291.1	176,628	172,317	— 2.4
Lambeth	4,080.4	301,895	298,058	— 1.3
Lewisham	7,014.4	127,495	160,834	+ 26.1
Paddington	1,356.1	143,976	142,551	— 1.0
Poplar	2,327.7	168,822	162,442	— 3.8
St. Marylebone	1,472.8	133,301	118,160	— 11.4
St. Pancras	2,694.4	235,317	218,387	— 7.2
Shoreditch	657.6	118,637	111,390	— 6.1
Southwark	1,131.5	206,180	191,907	— 6.9
Stepney	1,756.6	298,600	279,804	— 6.3
Stoke Newington	863.5	51,247	50,659	— 1.1
Wandsworth	9,107.4	231,922	311,360	+ 34.3
Westminster	2,502.7	183,011	160,261	— 12.4
Woolwich	8,276.6	117,178	121,376	+ 3.6
City of London	675.2	26,923	19,657	— 27.0
Administrative county	74,816.0	4,536,267	4,521,685	— 0.3
OUTER RING				
Middlesex:				
Urban districts	100,688	755,218	1,078,334	42.8
Rural districts	48,013	37,258	48,131	29.2
Total	148,701	792,476	1,126,465	42.1
In Surrey:				
Urban districts	42,862	334,619	438,778	31.1
Rural districts	37,237	50,014	87,588	75.1
Total	80,099	384,643	526,366	36.8
In Kent:				
Urban districts	22,991	129,271	148,472	14.9
Rural districts	20,290	21,795	23,855	9.5
Total	43,281	151,066	172,327	14.1
In Essex:				
Urban districts	49,744	663,615	838,938	26.4
Rural districts	10,692	8,599	10,672	24.1
Total	60,436	672,214	849,610	26.4
In Hertfordshire:				
Urban districts	15,852	37,431	45,386	21.3
Rural districts	20,239	7,305	9,519	30.3
Total	36,091	44,736	54,905	22.7
Outer ring	368,608	2,045,135	2,729,673	33.5
Greater London	443,424	6,581,402	7,251,358	10.2

Aspects of the City. There is no point of vantage in London where the whole city may be seen even on the clearest day. The view from the top of the Fire Monument, in the centre of the city, still reveals the roofs of numberless houses on the horizon. London has grown, not like most great cities, around a centre, but is the outcome of the merging together of many towns and villages. These various centres differed from one another, and gave much of their distinctive personality to the districts in the great city which they occupy. Thus London is an assemblage of urban districts, each differing from the other and having its distinctive appearance and history. Warehouses are the predominant feature in one region; banks or factories, palaces, villas, or tenement houses each give a distinct individuality to other districts. The impression which the city as a whole makes upon the visitor is not entirely favorable. The streets are narrow and the more densely peopled districts in particular lack sun and air. The city is well provided with parks, commons, and open spaces, which cover 9 per cent of its entire area. It is a giant among cities, but in beautiful, attractive aspects it is inferior to many others. It has many fine buildings, but in its larger features it is positively ugly when compared, e.g., with Paris, which, particularly under the régime of Napoleon III, waxed not only in size and importance, but also in its æsthetic aspects. Love for the practical and useful predominated over love for the beautiful in the making of London. The prevailing cloud, mist, and fog in the atmosphere of England, due to the neighboring seas, are intensified in this enormous aggregation of houses and inhabitants; and the exclusive use of bituminous coal both for domestic and industrial purposes fills the air with smoke which smirches the house walls and gives the whole city a dingy aspect. The greatest development of the city from the small original nucleus near the Tower has been to the north and west, the Surrey or south side of the Thames embracing only about one-third of the present metropolitan district.

Climate. London is an exceptionally healthful city. Its climate is dry, with a rainfall below the average of England and Wales. The only drawbacks consist of smoke and fog which aggravate diseases of the respiratory organs. The notorious density of London fogs is due to coal smoke. They are less dense at Hampstead and Highgate in the north or at Streatham in the south than at Whitechapel or Rotherhithe. In spite of the efforts of the Smoke Abatement Society little alleviation of the annoyance is observable. The mean annual temperature is about 50° F., ranging from 39.9° for the quarter ending in March to 60.4° for the quarter ending in September. The warmest month in London is generally July, with an average temperature of 64° F. January, the coldest month, has an average temperature of 39° F. The annual fall of rain is nearly 25 inches, while at Plymouth, in the west, it is 40 inches. London has about 1734 hours of bright sunshine in the year out of a possible total of 4459 hours.

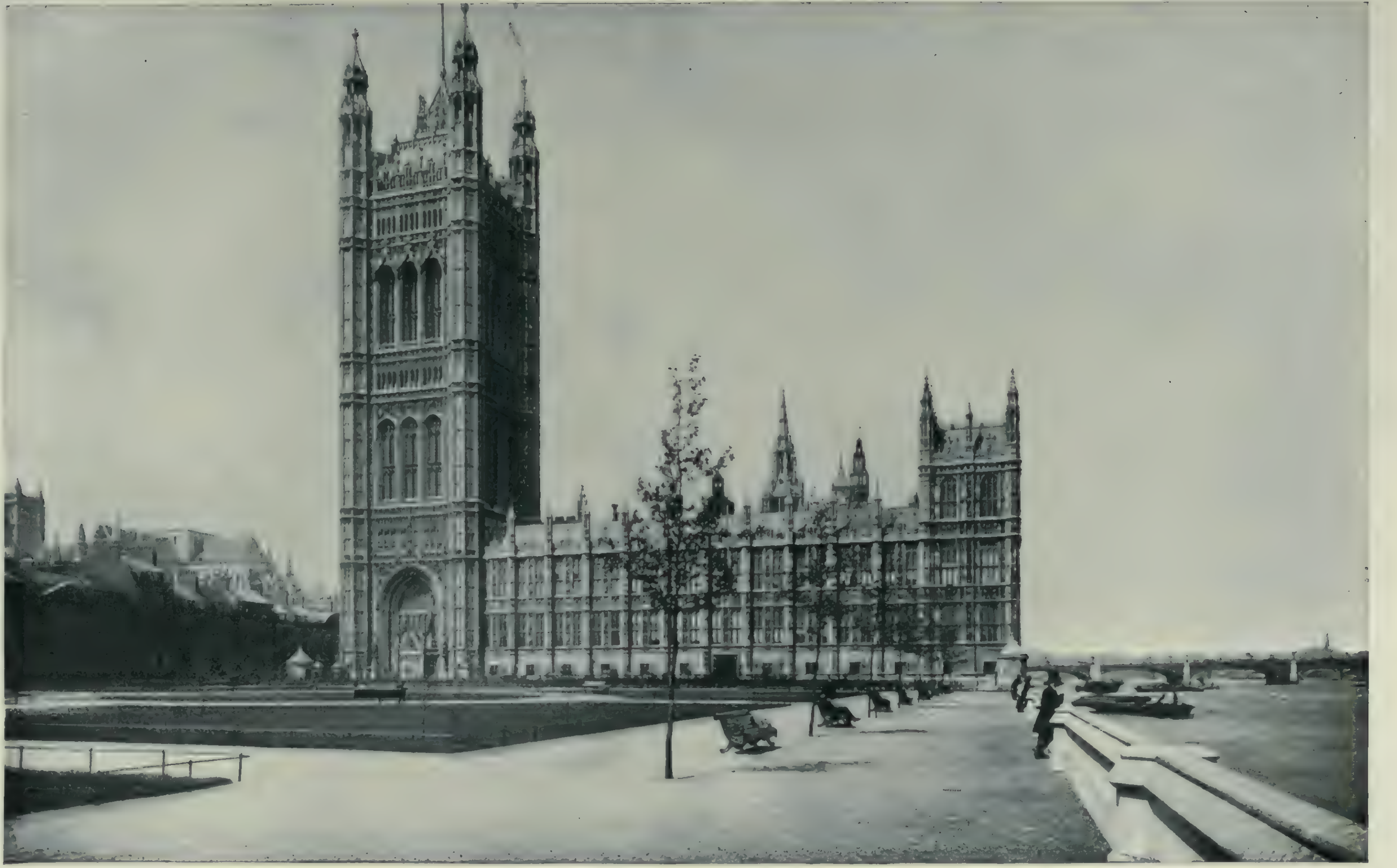
Streets. Most of the streets are narrow and many of them are inadequate, particularly in the large business districts, where the congested conditions of the street traffic are a great disadvantage. As a result of a comprehensive scheme of the London County Council for the widening and lengthening of several streets, including the Strand and Fleet Street and Piccadilly, and for the laying out and construction of new streets, West London is fast becoming a new London. Two fine new thoroughfares—Kingsway and Aldwych—were opened in 1905. Their construction completed part of the plan for the improvement of the Strand and Holborn. The new Charing Cross Road and Shaftsbury Avenue have replaced districts that were unsanitary and overpopulated. The finest promenade in London is along the Thames Embankment, which is buttressed up by a wall of large granite blocks. Regent Street, where the most fashionable shops are situated, has ample width, but its architecture is plain and monotonous. Buildings of more imposing quality have been erected in considerable numbers on Oxford Street, which ranks next in importance among the business thoroughfares. Westminster, which is the centre of the official life of London, has been largely rebuilt. Piccadilly is famous for the shops that line its eastern half and the fine dwellings and clubhouses along its western extension. Among other familiar streets, many of which are treated under separate titles, are Fleet Street, mainly devoted to the newspaper trade; Paternoster Row, near St. Paul's Cathedral, the headquarters of the book trade; Downing Street, containing the new government offices; Holborn Viaduct, an elevated street overcoming the steep descent of Holborn Hill between Newgate and Hatton Garden, and lined with fine stores; Bow Street, with its celebrated police court; the Haymarket, with its theatres and hotels; Bond Street, the seat of the retail jewelry trade; and Pall Mall, a street of handsome buildings and the centre of club life.

Buildings. The greatest innovation in the building enterprises of London is the multiplication of very large and handsome hotels, the increasing number of theatres which far surpass the old buildings in architecture and in the safety, convenience, and beauty of their interior arrangements and fittings, and the construction of apartment houses and flats, formerly unknown in London. All parts of London are alike in the fact that most of the houses are built of brick, and all are blackened by the smoke-laden fogs, though the West End suffers least from this discomfort. There are no quarries in the neighborhood, and for this reason the ordinary houses are of brick, while the stone for the finer buildings is brought from a great distance. The buildings in 1911, in the administrative county of London, included 571,717 inhabited and 33,006 uninhabited structures.

London has expanded principally towards the west, as the purifying winds usually blow from that direction. The fashionable and wealthy live in the West End (the neighborhood of Hyde Park and Kensington Gardens), and thus escape most of the smoke-laden air of the factory districts. Holland House, one of the stateliest types of Jacobean architecture, stands amid ample and beautiful grounds in Kensington. In the West End are also the palatial residences of the aristocracy who deserted their residences farther east in the districts now occupied by commercial London. The town houses of the aristocracy are generally found at Mayfair, Belgravia, and Park Lane. The houses of most of the great English noblemen residing in London mostly belong to the Georgian architecture. Just east of the city, now the financial centre of London, are the poorest quarters of London (the East End); here the annual death rate is from 30 to 60 for every 1000 persons. Some of the narrow streets in the Rotherhithe, Bermondsey, and Lambeth districts, south of the Thames, are also the abodes of the poorer classes.

Extending far north of the city are tens of square miles of houses of the common English type occupied by the lower middle classes, who live comfortably on modest incomes; and on the outskirts of the city to the north and east are great districts chiefly inhabited by artisans living in small but neat houses. In the northwest are many more square miles with higher and larger houses, many of them architecturally pretentious, the homes of the wealthier middle class. Thousands of these houses are luxurious homes.

The most striking edifices in the City are banks, exchanges, warehouses, and offices, among which still stand a number of edifices which were the palaces of the nobility before commerce drove them farther west. The Royal Exchange, one of the best-known buildings, is built in classic style,



LONDON
THE HOUSES OF PARLIAMENT
FROM THE SOUTH

with a simple portico of Corinthian pillars. During the day more than 1,000,000 human beings are working within the narrow limits of the City. At night its only inhabitants are the caretakers with their families and the police.

Two of the royal palaces, once in the heart of the fashionable quarter, are now considerably east of the aristocratic part of London. These are St. James's Palace (q.v.), lying directly eastward of Belgravia, the most fashionable part of London, and Buckingham Palace, isolated by the parks in front of it and the royal private gardens in the rear, but within sound of the roar of commercial Victoria Street. Other notable palaces are Marlborough House (q.v.); Kensington Palace (q.v.) on the west of Kensington Gardens; Lambeth Palace, the archiepiscopal residence of the primates of England; and Whitehall (q.v.), the ancient palace of the archbishops of York, replete with historic associations, and now used for public offices.

The Tower (q.v.) is the most venerable of the old buildings. It stands on the Middlesex bank of the Thames at the southeast corner of the City. The ancient walls, the fine building called the White Tower, St. John's Chapel, one of the finest specimens of Norman architecture in Great Britain, and other structures of more modern date stand amid a garden and drill ground every inch of which is historic. This scene of former crimes and suffering is now used as an arsenal and armory, and the crown jewels of the Kingdom are kept there. Westminster Abbey (q.v.), less ancient than the Tower, was built in the city of that name long since merged with London. In spite of additions and restorations not approved by the architectural taste of to-day, the Abbey remains one of the most perfect specimens of Gothic architecture in England. Its interior is strikingly beautiful, though much crowded with monuments reared to royalty and hundreds of the great men of the country. Among the largest Gothic edifices in the world are the Houses of Parliament, standing on the bank of the Thames, with a river front of 940 feet, covering 8 acres and containing more than 1000 rooms and two miles of corridors. The chief external features are St. Stephen's or the Clock Tower, 318 feet high, containing the great bell Big Ben; the Middle Tower, 300 feet high; and the Victoria Tower, 340 feet high, with its handsome and lofty royal entrance. The chief interior features are the House of Peers, the House of Commons, Westminster Hall, part of the ancient Westminster Palace of the Anglo-Saxon kings, and the scene of numerous historical events of importance, the octagonal central hall with its noble monuments, the libraries, and the numerous courts. The dome of St. Paul's Cathedral (q.v.) rises high above London, is visible from most parts of the city, is the first object to impress the stranger, and is the noblest of the monumental structures. Here also are many monuments to military and naval heroes, artists, and other great men of England. The Mansion House in the Poultry, the official residence of the Lord Mayor, is an eighteenth-century structure in a Corinthian style of architecture; the Guildhall (q.v.), or City Council Hall, dates from 1411; the Royal Courts of Justice, a magnificent block of Gothic buildings on the Strand, were opened in 1882. The luxurious clubhouses are naturally grouped in the district where they are most accessible at once to the Parliament buildings and government offices, the financial centre of the old city and the aristocratic West End. The clubs are situated in the district between St. James's Park on the south, Piccadilly on the north, and Regent Street on the east. Most of the club buildings are impressive in proportions and architecture and are classed among the ornaments of London.

There are in London considerably over 100 theatres and music halls. The more prominent of the theatres are Covent Garden Theatre in Bow Street; the Drury Lane Theatre; the Lyceum, the Strand, the Savoy, the Adelphi, and the Gaiety, all in the Strand; the Haymarket; Her Majesty's Theatre; the Princess in Oxford Street; the Criterion in Piccadilly; the Kingsway; St. James's; Scala; Apollo and Daly's Theatre in Leicester Square. The chief music halls are the Alhambra and the Empire, both in Leicester Square, the London Hippodrome, the London Coliseum, the Oxford, the Tivoli, and the South of London Palace of Amusements, in London Road, holding 5000 persons. Among the exhibitions and amusements should be mentioned Madame Tussaud's Waxwork Exhibition, Agricultural Hall, Crystal Palace, and the Olympia.

The subscriptions of all classes for the maintenance of hospitals in London is very large. The total income of all the London hospitals in 1910 amounted to $4,000,000 approximately. St. Bartholomew's, Guy's, St. Thomas's, Charing Cross, the Foundling, and the London hospitals are among the best known in the city. They are attended by a yearly number of about 4,000,000 outpatients and 100,000 inpatients.

The city is adorned throughout with numerous monuments, statues, and memorials of eminent personages, the more remarkable being the Albert Memorial, between Queen's and Prince's gates, Kensington Gardens, opposite Albert Hall, a magnificent Gothic monument designed by Sir G. Scott and erected at a cost of $600,000; the Nelson Column, fountains, and other statues in Trafalgar Square; the colossal statue of Achilles or Guard's Monument, at Hyde Park corner, to the Duke of Wellington; the National Memorial to Queen Victoria, in front of Buckingham Palace; and Cleopatra's Needle, on the Thames Embankment, the companion Egyptian obelisk to the one in Central Park, New York.

Museums and Libraries. London is especially rich in museums. They are among the finest in the world; and some of them, devoted to specialties, are particularly notable. Perhaps the most famous of modern collections are those of the British Museum (q.v.), a vast edifice filled with countless treasures of art and nature. Many of its galleries are crowded with sculptures. The genius of Greece may be better studied in London than in Athens since Lord Elgin brought his famous collection of marbles to London in 1816. The most interesting and admirable examples of the sculptural arts of Egypt, Assyria, and other parts of the ancient world may be seen in these galleries. The library contains more than 3,500,000 volumes. The National Gallery on the north side of Trafalgar Square includes more than 1500 paintings, the old masters being well represented. The building is in the classical style raised high upon a terrace. It was opened in 1838. This gallery has large funds at its disposal, and is thus enabled to secure many of the choicest specimens of European art. The pictures are arranged according to schools, chronological sequence being adhered to within the classification. Among its masterpieces should be mentioned the "Ansidei Madonna" by Raphael, which hangs in the Umbrian school. Another of its famous pictures is Van Dyck's "Charles the First." The Spanish school is especially well represented. The Royal Academy of Art occupies a section of New Burlington House, facing Piccadilly, and is noted for its collection of rare works and for its annual exhibition of paintings and sculptures. The Society of Royal Academicians, founded in 1768, consists of 40 Royal Academicians, 30 Associates, and 2 Associate Engravers. The National Gallery of British Art at Millbank, or the Tate Gallery, as it is familiarly called, is a branch of the National Gallery.

The Victoria and Albert Museum, formerly the South Kensington Museum, has a great variety of the choicest art products. It is not only a museum, but also the most important school of art and industrial science in Great Britain. Separated by Exhibition Road is the fine block containing the buildings of the Imperial Institute, with its permanent exhibition of the products, manufactures, and industries of the Empire; the Natural History Museum, with its complete collection; the Royal College of Music; and the Royal Albert Hall of Arts and Sciences, accommodating 8000 persons, and containing one of the largest organs in the world. Mention should also be made of the Wallace collection in Hertford House, Manchester Square. This is supposed to be the finest private collection in the world. It became the property of the British nation in 1897. Its value is estimated at $20,000,000.

Among the special museums and collections offering admirable facilities for students and scientific workers are the Anatomical Museum in the College of Surgeons, the Geological Museum, and the museums of the Royal Geographical Society and the Royal Society, at the head of scientific organizations in Great Britain; and of the Anthropological Institute and the Geological and Linnean societies. About 1,000,000 persons every year visit the most complete collection of living animals in the world, installed in Regent's Park and the property of the Zoölogical Society. The beautiful gardens of the Horticultural and Botanical societies have admirable collections, which, however, cannot be compared with the unsurpassed exhibits at Kew Gardens, which are probably the most varied and the richest in the world. The Crystal Palace (q.v.), south of London, has many beautiful models of architectural and art works, but the great building in the midst of a garden of 200 acres is maintained more for recreation than for instruction. The People's Palace for East London, on the Mile End Road, is an immense structure comprising a large amusement hall, free library, reading rooms, technical college, engineering workshops, chemical and physical laboratories, school of art, a winter garden, gymnasium, and swimming baths, all devoted to the intellectual and material advancement, the recreation and amusement of the vast artisan population of the East End. Many other societies and institutions have large libraries, most of which are accessible to the public.

Parks and Squares. London has 6588 acres of squares and open places, but they are by no means adequate for so large a population. Among the principal squares are Trafalgar Square, with fine monuments, and surrounded by handsome buildings, including clubs, hotels, the National Gallery, the National Portrait Gallery, the Royal Humane Society building, and the fine church of St. Martin's-in-the-Fields, containing the graves and monuments of many celebrities; Lincoln's Inn Fields, the largest square in London, surrounded by offices of the legal fraternity; Hanover Square, with St. George's Church, famous for its fashionable weddings; and the aristocratic Grosvenor, Cavendish, Portman, and Berkeley squares. Hyde Park, surrounded by fine residential districts, has a beautiful lake, broad avenues shaded by large trees, and fine expanses of grass with flower beds and clumps of shrubbery. In the height of the social season probably no park in the world equals the brilliant and varied scene that Hyde Park presents. Farther west are Kensington Gardens, more thickly planted with trees and plants than is Hyde Park. Regent's Park, in the northwest, is famed for its zoölogical and botanical gardens, large crowds being also attracted there in summer by the cricket matches. St. James's Park and Green Park, not far from Trafalgar Square, are among the old royal parks, long since open to the public. Besides other smaller parks, the gardens along the Thames Embankment are very popular; playgrounds here and there are maintained for children, and disused churchyards, with various squares and semiprivate gardens, add to the number of breathing places. Since 1901, through the efforts of the London County Council, new parks and playgrounds have been opened to the public. They include Hainault Forest (803 acres) and smaller parks in Twickenham, Eltham, and Clapton. Excursions to Epping Forest, known as London's playground, and many other delightful rural districts are very largely patronized. Most of the London parks are owned and maintained by the government, the City Corporation, the County Council, and various public bodies and persons.

Water. The main sources of supply are the Thames, above London, the Lea River, and various springs and wells in the locality. Until 1904 private companies had control of the water supply. Their aqueducts, reservoirs, and other appliances cost an enormous sum of money; but the companies did not sufficiently guard against the introduction of deleterious elements, and the city authorities failed for a long time to get the management of the water supply into their own hands. Their efforts were at length successful, and since June, 1904, the Metropolitan Water Board has assumed control of the water supply, which has improved in quality and is distributed to a population of over 7,000,000 persons. The daily supply of water delivered exceeds 225,000,000 gallons. It is brought in mains having a length of 6041 miles.

Sewers. Over $40,000,000 has been expended on the sewerage system of London. The length of the main sewers is over 87 miles. They discharge into outfall works at Barking on the north of the Thames and at Crossness on the south side, where the sewage is chemically treated and rendered innocuous, the overflow emptying into the river from 11 to 15 miles below London Bridge, and the sludge being taken 50 miles out to sea. It is only within the past 60 years that the provisions for removing and disposing of the sewage of London have, in a sanitary sense, been at all adequate.

Markets. The markets of London are among the great sights of the city. Many tourists leave their hotels at dawn to see the remarkable display of fruits, vegetables, and flowers in Covent Garden. For centuries the householders obtained their supplies from these markets. They are one of the city's oldest institutions, many of them being 1000 years old. Nearly all are under the control of the City Corporation. Enormous quantities of provisions and vegetables, fruits and flowers are still purchased by consumers at the markets; but retail stores are now found in all parts of the city, and the main trade of the markets is in supplying them with the commodities they sell to householders. The Central markets at Smithfield are the great source of meat supply for central London. It is calculated that about 430,000 tons of meat are sold annually here. The building occupies about 3 acres. The Leadenhall market is the principal market for poultry and game. Billingsgate is famous as the largest fish market in the world. Covent Garden market is more important than any other in the sale of vegetables, flowers, and fruits, which it draws from the whole world. At Islington is the metropolitan cattle market, exclusively devoted to domestic cattle. It is held twice a week. Foreign cattle are sold at Deptford. The coal market is the largest establishment for the sale of coal in the world. The poorer classes of the East End obtain nearly all their cheap vegetables and other supplies from street venders, the gross amount of whose annual trade is over $17,000,000.

Population. The population of Greater London, in 1901, was 6,581,402. In 1911 it was 7,251,358; 1921, 7,476,176. The population of the county and city of London in 1911 was 4,521,685, somewhat less than in 1901. Greater London contains more than one-fifth of the total population of England and Wales. More than half of the inhabitants were born in London, and the remainder in other parts of Great Britain and Ireland, excepting about 3 per cent who are natives of the British colonies and foreign countries. Germans, French, Dutch, Poles, and Scandinavians are particularly well represented; the number of Jews is more considerable than in any other city of England, and near the docks in the East End are not a few representatives of the Chinese, Hindus, and other Oriental peoples.

The death rate is smaller than in many of the large cities of the world. The rate of mortality in 1881 was 21.6 per 1000, or less than that of the 20 other largest towns of England; in 1899, with a total mortality of 88,063, in London County, the death rate was 19.4 per 1000. In 1906, by careful sanitary measures and the provision of new parks, it had been reduced to 15.2 per thousand, and in 1912 it was still further reduced to 13.6. In 1912 the living births numbered 110,353, or 24.5 per 1000. The birth rate largely exceeds the death rate, and the largest part of the increase in London population is derived from this source. The number of marriages in 1912 was 42,227, or 18.6 per 1000 of the inhabitants. In 1912 the number of illegitimate births was 4165, or 3.8 per cent of the total. The paupers of all classes (1911–12) numbered 128,593 or 28.47 per 1000 population. One of the greatest conveniences provided by the government for the common people is the numerous public baths and washhouses.

Education. In 1912 there was an elementary school population of 892,359, with an average attendance of 747,237. The expenditure on the elementary schools for the year 1911–12 was $23,395,000. The governing authority is the educational committee of the London County Council. The courses of study include all the common branches and are intended to fit the pupil for the ordinary vocations of life. There are also a large number of middle-class schools, with more extended courses of study. They are known as central schools, and some are supported by churches, corporations, societies, or endowments. Some of the endowed schools, such as St. Paul's and Charterhouse, have existed for centuries. St. Paul's was founded in 1509 and Charterhouse in 1611. The University of London (see LONDON UNIVERSITY) was merely an examining body previous to 1900. It embraces more than 25 institutions of all kinds, at the head of which are University College and King's College. The lectures of the University Extension are well attended, and are a useful feature of the free-education system. A number of large industrial schools are supported from the public funds. Nowhere in the world are there finer facilities for obtaining a thorough training in medical and surgical science than in the College of Physicians, the College of Surgeons, the other medical schools, and the hospitals of London. Medical students are attracted thither from all parts of the world. The study of law is pursued at the Inns of Court (q.v.). Although London is not a great centre of university education, it may justly be regarded as the scientific and literary centre of the British Empire—a position given to it by its numerous scientific societies, with their large collections, its great publishing houses, which issue more books than all the rest of Great Britain, and its newspapers and periodicals, more than 700 in number, which excel in influence and in literary quality.

Communications. Such immense multitudes as throng the leading thoroughfares of London during business hours are seen in very few other streets of the world. From the spacious stations of the Metropolitan and other railroads about 1,000,000 persons are emptied into the streets every morning. Every day over 100,000 foot passengers and over 20,000 vehicles cross London Bridge, the chief means of communication between the north and south banks of the Thames. Such streets as the Strand, Cheapside, Ludgate Hill, Cannon and Lombard streets on week days appear to be filled with a mass of omnibuses, cabs, carriages, truck wagons, and pedestrians. The omnibuses and motor cars carry about 500,000,000 passengers annually. Thousands of cabs and carriages are also largely patronized, for fares are cheap. A whistle blown on any doorstep in London is likely to bring a cab immediately. The horse-drawn vehicles are being superseded by the motor cars.

The underground railroads connect all quarters of the town and connect London with the great trunk lines. The underground and surface railroads carry fully 600,000,000 passengers a year. The trunk lines have most of their stations, some of them palatial structures, not on the outskirts, but in the very heart of the city. The chief of these are Waterloo, Charing Cross, Victoria, London Bridge, Paddington, Euston Square, St. Pancras, King's Cross, Broad Street, Liverpool Street, Bishopsgate, and Fenchurch Street. In 1907 there were in the county of London over 120 miles of street railroads in operation. At present (1915) over 250 miles of lines form the London network. About 7800 trains arrive in and depart from London daily. A large portion of these lines has been electrified. Rapid transit is thus afforded to every part of the business and manufacturing districts. It is chiefly due to these facilities for rapidly reaching the business centres that London has been able to spread itself far over the surrounding country, to the great advantage of public health. The result is that most of the people live in houses only two to five stories in height, instead of being packed together in buildings of great altitude. Street cars, or trams, do an enormous business, chiefly in the outlying districts. The Thames has also been a great means of communication between the east and west of the city, though the service of the river passenger boats is declining. Its tunnels—the Thames, Blackwall, and Greenwich tunnels, and the Tower Subway—form continuous streets between north and south London. The Rotherhithe tunnel was opened in 1908. It is a much-traveled highway and cost about $8,750,000. Among the bridges proceeding from east to west are the Tower Bridge, London Bridge, Blackfriars Bridge, Waterloo Bridge, Charing Cross Bridge, Westminster Bridge, Lambeth Bridge, Vauxhall Bridge, Chelsea Bridge, Albert Bridge, and Battersea Bridge. Besides these bridges and tunnels 6,000,000 people use annually the Woolwich Free Ferry connecting Woolwich with North Woolwich.

The Port. The port of London extends from Teddington Lock, 19 miles above London Bridge, to an imaginary straight line drawn from Havengore Creek in Essex to the Land Ends at Warden Point in Sheppey, Kent. The dockage facilities are now embraced between the Tower Bridge, at the Tower of London, and Tilbury Dock, 35 miles down the river. The docks were taken over in 1909 by the port authorities. Altogether they have a water area of 645 acres. All are closed docks, access to them being obtained by means of locks. Previous to the nineteenth century the business of the port was carried on under many disadvantages. Small sailing vessels were tied up near the shore, and the larger ones were anchored in the stream. Lighters carried the cargoes between the quays and the shipping. The manipulation of freight was under difficult conditions. The best wharfage facilities were provided by the so-called Legal wharves, between London Bridge and the Tower, private property, whose owners charged exorbitant rates. Vessel owners and merchants were not able to free themselves from this monopoly or to secure authority to provide accommodations for themselves along the river till the year 1802, when the first of the artificial basins, the West India dock, was built; this great improvement was soon followed by others, and the present dock system was rapidly developed. Most of the docks extend along the river front on the promontories formed on the north and south shores by the winding course of the river between Tower Bridge and Woolwich. They are great artificial basins excavated a short distance back of the river, with which they are connected by deep and broad channels. The mightiest of steamships as well as numerous smaller vessels are moored at these docks. Very large vessels come upriver to London Bridge, but the great ocean liners berth in some of the large docks lower down. The word has come to mean in London not only an artificial basin, but also great warehouses on or adjoining the docks, and large railroad and wagon facilities for the receipt or removal of freight. The principal docks on the north bank of the Thames are St. Katherine's, London, West India, Millwall, East India, Royal Victoria, Royal Albert, and Tilbury. The great dock of the south bank of the Thames is the Surrey Commercial dock (350 acres). The Tilbury dock, opened in 1886, is not so large as some of the others, having a water area of only 55 acres, but, having been built later than the other great docks, has some improved facilities. The largest ships of the world can enter at any state of the tide, and each of the two graving docks has a length of 846 feet. Freight cars load and unload at the ship's side; and a vessel unloaded at one of the import docks needs only to be moored on the other side of the same dock to be loaded at an export dock. The London docks have many conveniences. Some of them have refrigerated cellars for the temporary storage of frozen-meat imports. Landing places and wharves where ships can discharge their cargoes also exist in addition to the docks. The fact that most of the shipping business of the port is carried on in these interior basins deprives the river front of much of its former appearance of activity. Passengers on the Thames boats may steam down the river from the Tower and see very few sea vessels excepting those that are passing up or down the river. The large number of vessels in the docks where thousands of men are loading or discharging cargoes are hidden from view by the buildings along the banks. The channel up to Tilbury is 26 to 30 feet deep at low water. The number of ships visiting the port is increasing, chiefly on account of the enormous local market for products that London provides. The result is that port charges are very expensive and vessels are delayed in the transaction of their port business. Merchants complain that the shipping trade is being driven to other ports. The problem of increased facilities is receiving much attention from the government. A bill introduced in 1908 "to provide for the improvement and better administration of the Port of London" has since become a law. Since that year the construction and operation of docks, wharves, jetties, and piers have been in the hands of the port authority. The enormous coasting trade tributary to London, double that of Liverpool, contributes to make the port the busiest in the world. On an average a vessel arrives in the port of London every 10 minutes. Pilotage is compulsory in the London district for all vessels over 60 tons' burden. The famous Trinity house is the pilotage headquarters.

Commerce. London leads the cities of the world in the value of its commerce. Its total foreign trade has amounted for years past to considerably over $1,000,000,000 a year. In 1900 it was about $1,300,000,000, and in 1912 it was $1,866,930,000. The tonnage of the oversea vessels entering and clearing in 1900 was 16,700,727 tons, and in 1912 it was 19,548,000 tons. In recent years London, while practically holding its own in the amount of exports of home products and imports for domestic consumption, has lost much of its forwarding trade, chiefly because Hamburg, Rotterdam, Antwerp, Bremen, and Amsterdam, in the course of the large development of their shipping trade, have established many connections with foreign ports that they formerly did not possess; consequently they do not now rely so much upon London for a part of their over-sea transportation. London, however, is still more thoroughly connected by direct lines of communication with all quarters of the globe than any other port; and its business is greatly augmented by the fact that its coasting trade with the other ports of Great Britain is about equal to that of all the other ports together.

Three-fourths of the great aggregate of London's over-sea trade is imports, the exports being comparatively small. There are several reasons for this disparity between the import and the export trade. In the first place, London is the largest nucleus for the consumption of food supplies and many other commodities in the world. The amount of foreign supplies brought in for consumption in the metropolitan district is greater than the total imports of many large seaports. Vegetables are brought in from as far away as Spain and the Canary Islands. Then London, the centre of the railroad system of the island, is the largest distributing point for commodities purchased in the neighboring European countries for consumption throughout Great Britain. Nearly all British imports also that are of high value and small bulk come to London for distribution either inland or to foreign countries. London is the chief British market for most colonial wares, and some other foreign and colonial products, such as spices, indigo, cacao, jute, tin, hides, fur, ivory, precious stones, petroleum, and spirits. It is the largest market for tea and coffee, but is surpassed by Liverpool in imports of raw cotton, rice, and tobacco. More than one-third of the entire British import trade falls to London. It is second to Liverpool in the export of British manufactures and other products, but controls more than one-half of the country's export forwarding trade. A good grasp of the trade of London is had by considering that in 1910 out of a total value of $3,390,000,000 of imports for the United Kingdom London took $1,140,000,000 worth. The share of the capital in the exports is approximately as high.

The most important and bulkiest article among London's imports is wool, which is sent direct to the metropolis from Australia, the Cape of Good Hope, and Argentina, to be sold at auction at the Wool Exchange, the largest of the world's wool markets. Great quantities of the fibre are reshipped to the European mainland, and important amounts are sent to the United States. The larger part of the foreign and colonial commodities reshipped from London goes to the other European ports. A large share of the West Indian trade passes through London. American oil, Canadian cheese, Baltic timber, are largely monopolized by London merchants. The heart of the business world of London is the City proper. Here are found the Bank of England, the main offices of the great banking and insurance companies, as well as the offices and warehouses of the leading merchants and corporations.

Industries. More than 1,000,000 persons are engaged in manufacturing pursuits. Although London is not preëminent in special lines of production, as Birmingham, Leeds, and Sheffield are, it is still the leading manufacturing city of the Kingdom. In east London alone 400,000 people are engaged in making clothing. In the northeast section of the city dwell 50,000 furniture workers. The industries are widely distributed through the metropolis, but the great region of factories extends in a semicircle to the east and south of the City of London, from Clerkenwell through Spitalfields, Bethnal Green, Mile End, Rotherhithe, and Southwark to Lambeth; thus the Surrey side of the Thames, as well as the East End to the north of the river, is well represented in the manifold manufactures of the metropolis. Over 20,000 men, in round numbers, are engaged in making machinery, 30,000 in the printing industry, and over 6000 in weaving silk. Wall paper, glass, pottery, musical and surgical instruments, jewelry, clocks, watches, and goldsmithery are conspicuous for the quality and quantity of their product. The leather, saddlery and other leather wares of London have made a great reputation. Over 200 breweries turn out an astonishing quantity of beer and ale, the national beverages. Most of the breweries have sunk artesian wells and obtain an ample supply of pure water. Over 600,000 persons are employed in the building, fitting, and furnishing of houses. London was the great shipbuilding centre in the days of wooden vessels; but now that iron and steel have largely supplanted wood, the industry is much reduced, as more northern ports have the advantage of being nearer to iron and coal. The city also stands at the head of English towns in the industries connected with the printing trade and bookbinding. Hundreds of other industries give employment to thousands of working people.

Finance. London is still the chief money centre of the world. The business of the great bankers has been conducted on Lombard Street and in its neighborhood since mediæval times. The centre of the banking business of the country is the Bank of England, the chief bank of deposit and circulation in Europe, housed in a plain, low building covering four acres and almost devoid of ornamentation except at the northwest corner, which was copied from a Roman temple. Its vaults contain about $100,000,000 in gold and silver. A detailed account of this institution will be found in the article Bank, Banking. The private and joint-stock banks number about 225, most of which are members of the clearing house, where a daily exchange of drafts and checks is effected. The 3000 members of the Stock Exchange, near the Bank of England, buy and sell all the stocks and shares which are sanctioned by the governing committee. Trading in special articles is done in other exchanges, among which the Corn Exchange in Mark Lane, the Shipping Exchange in Billiter Street, the Wool Exchange in Coleman Street and the Coal Exchange in Lower Thames Street are well known.

The enormous accumulation of capital in the chief cities of the Kingdom results in surplus funds tending naturally to London, where there is a constant demand for money to float enterprises in all parts of the world. It is to London that colonial projects, railroad and harbor development schemes, wild-cat undertakings, and countless other enterprises, legitimate and illegitimate, from all quarters, look for the necessary funds. Many agents of London money lenders and companies are scattered all over the world, looking for new fields for exploitation or inquiring into the merits of numerous enterprises that are seeking financial assistance. Information as to the prospects for safe investment in all parts of the world is constantly flowing into London. The money centres of other European countries have their agents in London, and keep closely in touch with this unequaled centre of finance. The city is a great brokerage centre for a considerable amount of commerce handled through other cities. The case of firms importing rubber and wool may be mentioned. Their offices are in London, but their wares are handled mainly at other ports. London is also the chief centre of ownership and management of practically the entire tonnage of British shipping, which amounts to three-fifths of that of the entire world.

Government. The governmental system of London has been evolved from centuries of experience as to the special needs of the metropolis, and differs greatly from the local government of any other city in the Kingdom. The British government exercises the central control. Parliament defines the duties and powers of the local authorities and the areas over which their functions are exercised. Certain departments of the government supervise and control the acts of the various local authorities. The consent of the Board of Trade, e.g., must be obtained for any extension of the electric-lighting system. The Board of Education has power to withhold the government grant unless the efficiency of the school system in each district is kept up to a certain minimum. No park or common may be inclosed without the consent of the Board of Agriculture. The Local Government Board, also a department of the general government, has the widest supervision of the acts of the local authorities, and especially over the finances of the city. The local bodies cannot raise a loan without the consent of this board or a special act of Parliament.

The ancient City of London has its own government, handed down from the Middle Ages; its own sheriff, police, and courts; controls the bridges that connect it with south London, and exercises authority over most of the London markets, as they are in its territory. Its chief authorities are the Lord Mayor, 26 aldermen, and a common council composed of 206 members. The councilors are elected by the ratepayers; but the Lord Mayor, sheriff, and some other officers are chosen by the guilds or livery companies. (See GUILD; COMPANY.) These number 76, though some represent trades that have long been extinct. They are very wealthy. Twelve of these, known as the Greater Companies, have yearly incomes ranging from $60,000 to $415,000. A large amount of their income is spent in charity and entertainments of various kinds. The City government controls all the affairs of the ancient City, excepting questions relating to the main drainage.

Outside of the ancient City the central authority is vested in the London County Council, whose jurisdiction extends over London County, but does not include the outlying circle of the urban district that has grown up around London County and with it forms Greater London. It, however, has authority throughout the entire urban district over those features of the public service that must be under central control, such as the main drainage or sewerage, the provision of parks, and the fire department. The police department is an exception, for the police are regarded as being as much a general British as a city force, and are directly under the control of the Home Office. The total police force numbered 22,048 in 1914.

The limitation in 1888 of London to a county around its ancient nucleus, divided into 28 administrative boroughs comprising 30 parliamentary boroughs, returning 58 members, took effect in 1900. Each administrative borough has its mayor, aldermen, and common council, responsible only to the central government, except in the matters of common interest above mentioned, which are under the control of the London County Council.

There are many boards having special functions, such as the London School Board and the Metropolitan Asylums Board. The Metropolitan Asylums Board has charge of all the asylums for imbeciles, the hospitals for cases of infectious disease, and the training schools for children. The expenditures every year for the relief of the poor, and other assistance provided for by the Poor Law, amount to more than $15,000,000. The annual cost of the entire government of the city is considerably over $100,000,000; the total debt is over $537,000,000. The taxes to meet the expenditures are levied over the whole area, in proportion to the population of the various districts. The well-founded complaint that the taxes were disproportionately heavy upon the poorer districts has been met by various expedients to equalize the burden.

History. When the Romans landed in England they found London already a town of considerable importance. Tacitus wrote that the town was famous for its many merchants and large trade. The Romans, however, did not make London the administrative centre of their British province, though they founded a colony whose buildings extended along the left bank of the Thames from the Tower to the neighborhood of St. Paul's and north to Finsbury and Moorfield. Alfred the Great in the ninth century made London the capital of his kingdom. One of the first acts of William the Conqueror in England was to begin the erection of the Tower, which was intended as a citadel to overawe the citizens and give him command of the city. The Normans greatly improved the appearance of all the larger towns in the country. Many of them settled in London and erected handsomer buildings than had hitherto been seen in England. The stone buildings, however, were confined to monasteries, churches, and public edifices, all ordinary buildings being still constructed of wood—a fact that promoted the spread of the great fires from which London suffered, the first of which occurred in 1077. The wooden London Bridge was torn down in 1176 and rebuilt with stone, there being 20 arches and a drawbridge. This structure, completed in 1209, was in service till early in the last century, when it gave place to the present bridge. The wealth, commerce, beauty, and magnificence of the London of the early part of the Plantagenet period are frequently referred to by the writers of that day; but there seems to be satisfactory proof that in 1377 the city had a population of less than 35,000. Throughout the Middle Ages the progress of London was slow, and was repeatedly arrested by wars, commercial crises, and epidemics. London naturally has always shared both the prosperity and the reverses of England. The fact that most of the area now in the heart of the city was in a wild and uncultivated state as late as the time of Henry VIII is shown by his edict for the protection of game birds in the region from his palace "at Westminster to St. Giles-in-the-Fields, from thence to Islington, Hampstead, and Hornsey Park." The monasteries and other religious houses founded by the Normans were either converted by Henry VIII into hospitals (including St. Bartholomew's Hospital) or the rents were applied to charitable purposes. The sixteenth century witnessed a great expansion of British trade, and as transoceanic lands were brought within the sphere of European commerce a great impetus was given to the progress of London.

The opening by Queen Elizabeth of the Royal Exchange was one of the events marking London's growth in world importance. Fearing that the city might become too great and powerful, the Queen issued in 1580 her famous proclamation prohibiting the erection of any new buildings for 3 miles outside of the city gates. It was impossible, however, to fix by decree the limits of inevitable expansion, and the growth of the city was scarcely checked even by the frightful calamities, the political turmoil, and the civil wars that marked the era of the Stuarts. London had at various times been sorely stricken with pestilence, but in the infliction that passed into history as the Great Plague her sufferings from outbreaks of infectious disease reached their climax. In 1665 about 100,000 Londoners died in six months of the plague that broke out; it was followed the next year by a fire which began in the heart of the city and laid London in ashes from the Tower to the Temple. The loss in buildings and merchandise was beyond count. Thirteen hundred houses and 19 churches were destroyed. Prostrate as London was, the fire was not an unmixed calamity. The London built of wood had vanished to give place to a city of brick and mortar, with wider streets and more open spaces. Most conspicuous features in the rebuilding of London were the cathedral of St. Paul's and many lesser churches which covered the name of Wren with renown.

At the beginning of the eighteenth century Paris equaled London in population, and no doubt surpassed it at some earlier periods. The footing which England gained in India gave London a fresh source of wealth through its rich commerce with the Orient; it was then that the city forged permanently ahead of Paris in number of inhabitants. The population, scarcely over 500,000 souls at the beginning of that century, increased to nearly 1,000,000 in 100 years. Building operations, with the increase of wealth, extended greatly in the West End; but what is now the north of London was almost wholly neglected, and, in fact, building was not extended in this quarter to a large extent till water was conveyed thither in pipes, because the underlying rocks do not retain the rainfall. Many of the streets were still in a wretched condition, and it was left for the nineteenth century to begin to widen and improve them. That century witnessed the taking in of a large number of suburbs on all sides, the first lighting of the streets with gas on the King's birthday (June 4, 1807), the rebuilding in stone of all the London bridges, and the infusion of a higher degree of taste in building operations generally. For the first time tradesmen began to make their homes in the suburbs or away from their places of business, so that one of the most impressive features of London life to-day is the rush of vast multitudes every week-day morning to business and the mighty ebb of these streams of humanity from the scenes of trade and finance at the close of the day. Steam power applied to machinery made London an industrial centre which, though surpassed by many other cities in single branches of manufactures, forms on the whole the largest aggregate of industrial activity in the world.

Bibliography. The literature on London is enormous, the earlier works being of especial interest from an antiquarian point of view. Among these are the first history of the city, written by a monk, Fitzstephen, in 1174 and afterward incorporated by John Stow in his *Survey*, which is the classic work on early London. This was written in 1598, continued after the death of Stow by various authors, including Anthony Munday and John Strype, and finally published at Oxford in 1908. E. Hatton, *New View of London* (1708), contains an alphabetical list of the streets. The fourth edition of Pennant, *London*, a very popular book, was printed in 1814. Allen, *History and Antiquities of London, Westminster, and Southwark* (1827–29), is a very valuable work, containing much information not found elsewhere. *London*, edited by Charles Knight (1841–44), and later revised by Walford, is not exhaustive, though parts of it are especially well treated. The *Book of British Topography*, by J. P. Anderson (1880), contains a bibliography of London, not exhaustive, but fuller than any other. For more recent books consult: Loftie, *London City, Its History, Streets, Traffic, Buildings, and People* (London, 1891); John Timbs, *Clubs and Club Life in London* (New York, 1899); C. de la R. Francis, *London, Historic and Social* (Philadelphia, 1901); T. R. Way, *Ancient Royal Palaces in and near London* (New York, 1901); Sir Walter Besant, *Survey of London* (8 vols., London, 1902–10), a history of the city from the earliest times through the nineteenth century; id., *The Fascination of London* (11 vols., ib., 1902–08), a topographical description of the city, begun by Sir Walter Besant and continued by G. E. Mitton; W. R. Lethaby, *London before the Conquest* (New York, 1903); G. L. Apperson, *Bygone London Life* (ib., 1904); H. B. Wheatley, *Story of London*, in the "Mediæval Towns Series" (London, 1904); W. D. Howells, *London Films* (New York, 1905); C. L. Kingsford (ed.), *Chronicles of London* (Oxford, 1905); H. B. Wheatley, *Hogarth's London, Pictures of the Manners of the Eighteenth Century* (New York, 1907); F. C. Howe, *The British City, the Beginnings of Democracy* (ib., 1907); G. E. Mitton (comp.), *Maps of Old London* (ib., 1908); W. W. Hutchings, *London Past and Present* (2 vols., London, 1909); William Benham, *Old London Churches* (Chicago, 1909); E. B. Chancellor, *Private Palaces of London, Past and Present* (Philadelphia, 1909); H. C. Shelley, *Inns and Taverns of Old London* (New York, 1909); George Unwin, *Guilds and Companies of London* (ib., 1909); Cecil Headlam, *Inns of Court* (ib., 1911); Helen Douglas-Irwin, *History of London* (London, 1912); A. St. J. Adcock, *Booklover's London* (New York, 1913); P. H. Ditchfield, *London Survivals: A Record of the Old Buildings and Associations of the City* (ib., 1914); L. Gomme, *London* (Philadelphia, 1914). Peter Cunningham, *Handbook of London* (1850), was brought up to date in H. B. Wheatley, *London, Past and Present* (3 vols., London, 1891); A. J. C. Hare, *Walks in London* (7th ed., 2 vols., New York, 1902), is replete with anecdote, historical association, and charming description. Baedeker's volume devoted to London contains very excellent and helpful maps, an enormous amount of accurate information, and is kept up to date by frequent revision (16th ed., New York, 1911); also Murray's *Handbook for Travellers* (2 vols., London, 1879, with later revisions). The condition and economic aspects of the laboring classes are exhaustively treated in Charles Booth, *Life and Labor of the People in London* (4 vols., London, 1892–1902). A very valuable source of information for the social conditions as well as for historical events is to be found in various letters and journals, among them being the diaries of Samuel Pepys and of John Evelyn, the letters of Horace Walpole, and the *Journal of the Plague Year* by Daniel Defoe. Various annual government reports give valuable and detailed information as to sociological, educational, governmental, and other conditions.

LONDON. A city and port of entry, the capital of Middlesex Co., Ontario, Canada, on the river Thames, 115 miles by rail southwest of Toronto, on the Canadian Pacific, the Grand Trunk, the Michigan Central, the Père Marquette, and the London and Port Stanley railroads (Map: Ontario, C 8). The city is also connected by electric railway with St. Thomas and Port Stanley and has steamship communication with Cleveland, Detroit, and other United States ports. The city has an Anglican and a Roman Catholic cathedral, a public library, post office and city hall (both completed in 1915), hospitals, an orphan asylum, a convent, and exposition building. The Western University and College, Huron College, London Conservatory of Music and School of Elocution, Roman Catholic seminary and school, and the London Collegiate Institute are the chief educational institutions. The fitness of its situation for a town was recognized as early as 1784. The site began to be cleared and the place laid out in 1826. The output of more than 230 manufacturing establishments includes iron goods, woodenware, brass and leather goods, agricultural implements, boilers, cigars and cigar boxes, furniture, engines, tinware, paper boxes, chemicals, beer, and biscuits. The value of the manufactures in 1910 was $16,273,999, as compared with $8,122,186 in 1900. Pop., 1901, 37,976; 1911, 46,300; 1915 (local est.), 58,000.

LONDON. A village and the county seat of Madison Co., Ohio, 25 miles west by south of Columbus, on the Cleveland, Cincinnati, Chicago, and St. Louis, the Ohio Electric, and the Pittsburgh, Cincinnati, Chicago, and St. Louis railroads (Map: Ohio, D 6). It is the commercial centre for a productive agricultural and livestock district and has a meat-packing plant, steel-burial-vault works, a creamery, a sheet-metal factory, tile works, a flour mill, and a corn cannery. Noteworthy features of the village are the Carnegie library, the State fish hatchery, the Ohio penitentiary farm, and the courthouse. The electric-light plant is owned and operated by the municipality. Pop., 1900, 3511; 1910, 3530.

LONDON, CONFERENCES OF. The name of several diplomatic meetings held in London. The first to be so designated resulted in July, 1827, in a treaty signed by England, Russia, and France to bring about the liberation of Greece from Turkey. The next, held by the Great Powers in 1830–31, recognized the independence of Belgium and arranged the terms of its separation from Holland. A third conference was held in 1840, on the Turko-Egyptian question, in which France refused to take part. (See MEHEMET ALI.) On Aug. 2, 1850, a protocol was signed in London by the representatives of all the Great Powers, declaring the indivisibility of the Danish monarchy, inclusive of Schleswig and Holstein. (See SCHLESWIG-HOLSTEIN.) This was followed by the London Protocol of May 8, 1852, respecting the succession in the Danish dominions.

1867. The conference of the six Great Powers (which for the first time included Italy) which met at London in May, 1867, to settle the political order of northern Europe after the disruption of the German Confederation in 1866. The immediate occasion of the conference was the necessity of settling the status of the Grand Duchy of Luxemburg, which, after the downfall of the First Napoleon, had been added to the dominions of the King of Holland as a separate and independent state and made a member of the German Confederation. Notwithstanding the dissolution of the confederation, Luxemburg continued to be occupied by Prussian troops, the French government insisting upon the removal of these troops and threatening war to enforce the demand. The conference was called to avert the new danger to the peace of Europe, and it solved the problem by the statesmanlike device of placing the Grand Duchy under the collective guaranty of the Great Powers as a permanently neutralized territory. The Prussian troops were to be withdrawn and the fortifications of the city of Luxemburg to be destroyed. Belgium, though not one of the Great Powers, was admitted to the conference by reason of her immediate concern in the settlement which should be arrived at, but did not become a party to the treaty. Being herself a neutralized state, she was deemed incapable of entering into an engagement which might involve her in a war to enforce the Luxemburg guaranty. The conference is notable for its clear recognition of the principle of neutralization and of the rights of a neutralized state, as well as of the obligations incurred by the Powers joining in the collective guaranty. Though threatened by Bismarck in the Franco-Prussian War in 1870, the neutrality established by the conference was strictly observed by all the parties thereto until the War of 1914, when Germany, which had succeeded to the obligations of Prussia as a guaranteeing state, violated the neutrality of the Grand Duchy by using its territory as a base of operations against Belgium and France. See BELGIUM; NEUTRALITY; NEUTRALIZATION.

1871. A conference of the Powers held in London in 1871, to adjust differences which had arisen under the Treaty of Paris (1856) with respect to the rights of Russia in the Black Sea. This treaty, which marked the termination of the Crimean War, had neutralized the Black Sea as well as the Bosporus and the Dardanelles and had prohibited the use of those waters by ships of war. Taking advantage of the Franco-Prussian War, the Russian government denounced the Treaty of Paris on the cynical principle that any power has a right to withdraw at its own pleasure from a treaty to which it had been a party. While this high-handed procedure was generally condemned, there was enough sympathy with Russia's desire to free herself from the intolerable restrictions of the Treaty of 1856 to lead to a reconsideration of the Black Sea question, as it was called. The London Conference, which met on the initiative of Bismarck, was attended by representatives of all the Powers that had participated in the Congress of Paris, viz., Great Britain, France, Austria, Prussia, Russia, Turkey, and Italy (which succeeds to the position of Sardinia). Russia gained the principal material advantage which she sought, the right to use the Black Sea for her ships of war; but the principle on which she had acted in denouncing the Treaty of Paris was explicitly repudiated. The conference declared that "it is an essential principle of the law of nations that no power can liberate itself from the engagements of a treaty, or modify the stipulations thereof, unless with the consent of the contracting powers by means of an amicable arrangement," a principle which has since been violated by more than one of the Powers which united in the declaration.

1909. A conference of 10 leading maritime Powers (Great Britain, Germany, France, the United States, Austria-Hungary, Italy, Russia, Spain, the Netherlands, and Japan), which convened in London on the invitation of Great Britain, Dec. 4, 1908, "for the purpose of determining in common what are the generally recognized rules of international law governing war at sea. The occasion for the conference was the refusal of Great Britain to ratify Convention XII of The Hague Conference of 1907, providing "for the establishment of an International Prize Court," on the ground of the indefiniteness of the law to be applied by the court. It was provided in that convention (Art. vii) that, in the absence of treaty provisions governing a matter in dispute, "the court shall apply the rules of international law. If no generally recognized rule exists, the court shall give judgment in accordance with the general principles of justice and equity." Great Britain, as the leading maritime and naval power, had the largest stake in the proposed International Prize Court (which was to exercise supreme appellate jurisdiction over the national prize courts of the several Powers adhering to the convention) and the greatest concern, therefore, in the rules and principles by which it should be governed. She felt that she must know in advance, so far as was possible, what those rules and principles would be. It was to determine this important matter, to settle the rules of international law, which the new tribunal should apply in the determination of controversies over prizes in maritime war, that Great Britain summoned what appeared at the time, and may yet prove to have been, one of the most important international conferences ever held.

All of the nations invited took part in the conference, which was composed of 37 delegates, 14 of whom were naval officers. It concluded its labors on the 26th of February, 1909, when the formulated "Declaration concerning the Laws of Naval War," consisting of 71 articles, with the closing protocol, was unanimously adopted, and the conference adjourned. This declaration marks a distinct advance in the rules previously recognized by belligerent nations as governing their conduct towards one another and with respect to neutral commerce, but it has unfortunately failed as yet to secure a place in international law. Consult Stockton, "The International Naval Conference of London, 1908–1909," in the *American Journal of International Law*, vol. iii, p. 596 (New York, July, 1909). See LONDON, DECLARATION OF; PRIZE COURT; PEACE MOVEMENT.

LONDON, DECLARATION OF. A code of rules to govern the practice of naval war adopted by the International Naval Conference held at London and promulgated Feb. 26, 1909. It represents an attempt on the part of the leading naval and maritime powers of the world to define the rules and principles which shall govern naval operations in time of war and which shall be obligatory on national courts of prize, as well as upon the International Prize Court to be established in accordance with the twelfth convention of the second Hague Conference (1907), and it covers the rights and obligations of neutral traders as well as the relations of belligerents with respect to warlike operations conducted upon the sea. It deals exhaustively, therefore, with such matters as the blockade of enemies' ports, contraband of war, unneutral service by the merchant ships of neutral states, the destruction of neutral prizes, the transfer of enemy ships to a neutral flag, the right of stoppage and search of neutral ships suspected of unneutral service, and the like. While the signatory powers unite in the statement that the rules agreed upon "correspond in substance with the generally recognized principles of international law," the declaration as a whole marks a decided advance on the rules previously in force, not only in definiteness and uniformity, but as well in the more generous recognition of neutral rights. As an eminent American delegate and reporter of the conference says of the declaration, "As for its provisions for defined contraband and free lists, for the limitation of area of capture in blockading operations, for limitation of confiscation of vessels as carriers of contraband, for the release and continuance on their course of vessels with small amounts of contraband, for the restriction of the destruction of neutral prizes to cases of urgent necessity, for the differentiating in cases of unneutral service, and for compulsory compensation in many additional cases, it has by their adoption relieved neutral cargoes and vessels from many vexatious uncertainties and neutral trade from many fetters without sacrificing any necessary belligerent rights in time of war" (Adm. C. H. Stockton, in *American Journal of International Law*, vol. iii, p. 615).

Unfortunately the declaration, though ratified by most of the signatory powers, has not secured the unanimous consent essential to put it into effect. It was submitted by the British government to Parliament for ratification and duly approved by the House of Commons but was rejected by the Lords. On the outbreak of the European War in August, 1914, Great Britain announced her intention of adhering to the declaration and of governing her practice of naval war in accordance with its rules, but shortly afterward withdrew from that position and reverted to the principles by which she had previously been governed. Her unquestioned command of the sea and the pressure which this enabled her to exert on Germany and Austria-Hungary in the course of the war led her to adopt a rigorous interpretation of those principles, to the serious detriment of neutral commerce—a course which evoked remonstrance from the American and other neutral governments.

For the text of the declaration, consult: Westlake, *International Law: War* (London, 1910); *American Journal of International Law* (supp., New York, 1909); and, for the laws and practice of naval war in general, the works cited under International Law.

LONDON, Jack (1876–1916). An American writer, born in San Francisco. Of an adventurous turn of mind, he had plenty of lively experiences as a boy; at 17 shipped before the mast as an able seaman, visiting Japan and Bering Sea; then tramped through the United States and Canada, partly to gather material for a series of Socialistic articles; and in 1897, after a short time at the University of California, went with the first rush to the Klondike. He was a newspaper correspondent during the Russo-Japanese War and in 1914 war correspondent in Mexico. In 1906 he started on a seven years' cruise around the world in a 50-foot ketch-rig yacht, but had to leave it uncompleted because of a tropical illness. (Consult his *The Cruise of the Snark*, 1911.) London's stories, usually of the open and often of the sea, are vividly written narratives. Filled as they are with the workings of impulse and the primitive emotions, too often they sacrifice art to an uncouth vigor of action and speech. His books, many of them very popular, include: *The Son of the Wolf* (1900); *The God of his Fathers* (1901); *A Daughter of the Snows* (1902); *The Children of the Frost* (1902); *The Cruise of the Dazzler* (1902); *The Call of the Wild* (1903); *The Faith of Men* (1904); *The Sea Wolf* (1904); *The Game* (1905); *Tales of the Fish Patrol* (1905); *Love of Life* (1907); *Before Adam* (1907); *Lost Face* (1909); *Burning Daylight* (1910); *Smoke Bellew* (1912); *The Abysmal Brute* (1913); *The Valley of the Moon* (1913); *The Mutiny of the Elsinore* and *The Strength of the Strong* (1914). Other volumes, of a Socialistic or sociological stamp, are: *The People of the Abyss* (1903), based on his vagabond adventures in the degraded East End of London; *The Kempton-Wace Letters* (1903); *The War of the Classes* (1905); *The Iron Heel* (1908); *Revolution, and Other Essays* (1910); *John Barleycorn, or Alcoholic Memoirs* (1913).

LONDON, Meyer (1872–). An American labor leader and Socialist, born in Poland. He spent his youth in southern Russia, but at 18, cut off from higher education by Jewish disabilities and incurring the government's displeasure by his revolutionary sympathies, he emigrated to the United States. After a precarious career as printer and cigar maker, he secured more congenial employment with the Educational Alliance in New York. This afforded a much coveted opportunity for advanced study. After his admission to the bar in 1898 he practiced in New York and was counsel chiefly for labor unions, in the establishment and building up of which he was instrumental. He was connected with two of the greatest labor disputes of recent times in the East (the cloakmakers' strike in 1910 and that of the garment workers in 1912), both of which he helped to settle—the first by means of the agreement known as an industrial protocol. In addition to his activities in the labor movement generally and as an East Side community worker, London became prominent as a Socialist. He was a delegate to the national convention of the Social Democracy in 1900 and to the national conventions of the Socialist party in 1910 and 1912, besides being chosen to represent American Socialists at the International Socialist Congress called for 1914 in Vienna, but not held on account of the European War. In 1914 he was elected a member of Congress from New York, being the first Eastern Socialist (the second in the United States) to gain this distinction. At the time he took his seat no other Socialist was a member of the House.

LONDON, Tower of. See Tower of London.

LONDON, University of. See London University.

LONDON BRIDGE. The most important bridge of London, connecting the city with the borough and until after 1750 the only bridge across the Thames in London. The first stone bridge at this point was completed in 1209 and was built up with rows of houses, forming a street which later became the centre for booksellers and other tradesmen. On it stood a chapel of St. Thomas of Canterbury, and a tower on which the heads of traitors were exposed to view. The present bridge, about 100 feet farther up the river, was designed by John Rennie and built by his sons in 1825–31. It is borne on five granite arches and is 928 feet in length, 65 feet in width, and 56 feet above the river.

LONDON CLAY. A term applied to a series of strata of Lower Eocene age, made up of clays, sands, and calcareous sandstones, occupying the lower basin of the Thames in England. Its total thickness is about 500 feet. It contains a large assemblage of marine invertebrate fossils as well as a few mammalian forms.

LONDON COMPANY. A branch of a joint-stock company, founded in London in 1606 for the purpose of planting two colonies in America. The two branches of the organization were called from their headquarters the London or Virginia and the Plymouth or North Virginia companies. To the London Company was assigned the territory between lat. 34° and 38° N., to the Plymouth Company that between 41° and 45°, while the region between 41° and 38° was to be under the control of the company which should found the first colony within those limits. The first expedition, under Newport, sailed on Dec. 19, 1606, with three ships and 105 emigrants, and on May 23, 1607, founded the settlement of Jamestown. Consult: E. D. Neill, *History of the Virginia Company of London* (Albany, 1869); Alexander Brown, *The First Republic in America* (Boston, 1898); S. M. Kingsbury, "A Comparison of the Virginia Company with the Other English Trading Companies of the Sixteenth and Seventeenth Centuries," in the *American Historical Association, Annual Report,* (Washington, 1906); *The Records of the Virginia Company of London,* edited with an introduction and bibliography by S. M. Kingsbury (ib., 1906); J. T. Ellyson, *The London Company of Virginia* (New York, 1908).

LONDONDERRY, lŭn′don-dĕr′rĭ. A maritime county of the Province of Ulster, Ireland, bounded north by the Atlantic, east by County Antrim and in part by Lough Neagh, south by Tyrone, and west by Donegal. Area, 816 square miles (Map: Ireland, D 2). The lowlands are fertile and produce good crops. The river Bann is celebrated for its salmon fisheries, besides being a source of power for the staple manufacture of Ulster, that of linen. The deep-sea fisheries are important, and the chief industries are distilling, brewing, and salt making. The capital is Londonderry. Pop., 1901, 144,330;

1911, 140,621, of whom nearly 50 per cent are Protestants.

LONDONDERRY, or DERRY. A city, seaport, and a corporate and parliamentary borough, capital of County Londonderry, Ireland, on the Foyle, 3 miles from its entrance into Lough Foyle and 144 miles north-northwest of Dublin (Map: Ireland, D 2). It is beautifully situated on a hill overlooking the river. The walls are still preserved and form an agreeable promenade; they surround a part of the town 1 mile in circumference, but the buildings have extended beyond. The left bank of the river is connected by an iron bridge, 1200 feet in length, with an extensive suburb called Waterside. The Anglican cathedral dates from 1633, and there is a handsome modern Catholic cathedral. The famous siege of 1689 is commemorated by a triumphal arch and by a column in honor of the Rev. George Walker, who was Governor of the city during the memorable defense. Among the educational institutions are Foyle College (1617) and Magee College (1857), both of which are affiliated with Dublin University. The chief industries are distilling, brewing, tanning, iron and brass founding, the manufacture of shirts and table linen, and extensive salmon fishing. The arrangements and appliances of the port are on a good scale. Steamers ply to Liverpool, Glasgow, and Belfast, and there is a large import trade in maize, wheat, petroleum, timber, flaxseed, etc. From this port a large colonial and coasting trade is carried on, and there is a considerable export of agricultural products, bacon, etc. The United States is represented by an agent. The town originated in a monastery founded in the sixth century by St. Columba. It was pillaged more than once by the Danes and was occupied, but with many vicissitudes, by the English at the invasion. The town formed part of the escheated territory granted to the London companies, and under their management it rose to some importance and was strongly fortified. In the Irish War of the Revolution Londonderry threw itself earnestly into the cause of William of Orange and closed its gates against James II. The siege of Londonderry in 1689 is one of the most celebrated events in Irish history. Since that date the city has steadily grown in extent and prosperity. About 5 miles west of the town is the famous Grianan of Aileach, a ruined fort, on the summit of a hill 803 feet high, of unknown antiquity. It was besieged, however, in 674 and 937 and ceased to be a royal residence in 1101. It was restored in 1874 and became a public monument in 1904. Pop., 1901, 39,873; 1911, 40,799. Consult Robert Simpson, *Annals of Derry, Showing the Rise and Progress of the Town from the Earliest Accounts to the Plantation under King James I, 1613* (Londonderry, 1847), and John Hempton, *Siege and History of Londonderry* (ib., 1861).

LONDONDERRY, CHARLES STEWART VANE-TEMPEST-STEWART, sixth MARQUIS OF (1852–1915). An English landlord and public official. He was born in London and was educated at Eton and at Christ Church, Oxford. He served as a Conservative member of Parliament for County Down from 1878 to 1884, when he succeeded to his father's title; was Viceroy of Ireland in 1886–89, chairman of the London School Board in 1895–97, Postmaster-General in 1900–02, President of the Board of Education in 1902–05, and Lord President of the Council in 1903–05; and became lieutenant of County Down in 1902. He was made Solicitor-General for Ireland in 1892 and held the same office for England in 1900–06. Throughout his life he was prominent in his stanch opposition to home rule for Ireland. In 1903 he received the G. C. V. O., and in 1906 the order of King Charles III of Spain. He owned 50,400 acres of land and had the largest collieries in Great Britain. His son, Viscount Castlereagh, born in 1878, succeeded him as seventh Marquis.

LONDONDERRY, CHARLES WILLIAM STEWART VANE, third MARQUIS OF (1778–1854). An English soldier and statesman. He was distinguished both as a soldier and diplomatist in the English service during the French and Napoleonic wars (1793–1815). He was Undersecretary of State for War in 1807 and Ambassador to St. Petersburg in 1835. His surname of Vane was added in 1819, on his marriage with a great heiress of that name and in 1823 he was created Earl Vane. In 1843 he became a colonel in the Life Guards. He wrote *A Narrative of the Peninsular War* (1828) and a *Narrative of the War in Germany and France in 1813–14* (1830), and edited the correspondence of his half brother, Viscount Castlereagh.

LONDONDERRY, ROBERT STEWART, second MARQUIS OF. See STEWART, ROBERT.

LONDON PHILHARMONIC SOCIETY. See PHILHARMONIC SOCIETIES.

LONDON ROCKET. See HEDGE MUSTARD.

LONDON STONE. A relic embedded in the walls of St. Swithin's Church in London and believed to be a fragment of the central milestone from which distances were measured.

LONDON UNIVERSITY. London University was founded in 1827 as a joint-stock company by subscription, largely owing to Lord Brougham. It was opened in 1828, with classes in the faculties of arts, law, and medicine, and the incorporators endeavored to obtain from the crown a charter giving them the power to confer degrees. In 1833 the Privy Council proposed a scheme of a university which, adopted by Lord Melbourne's government, became the basis of the present institution. It comprised the granting of a charter to London University College or other colleges of the same kind, the granting of another charter to a board of examiners, composed of persons eminent in literature and science, to be called the University of London, and the admission of properly certified pupils of University College and King's College, or of any other school named by the crown, to examination for the degrees. This scheme was adopted by the incorporators, and charters were granted by William IV, Nov. 28, 1836, constituting the University of London and University College—the former an examining, the latter an instructing body. King's College (q.v.), incorporated in 1829 by charter, and several colleges in London and elsewhere were named as places where students were entitled to present themselves for degrees. The charter of the university was renewed at the accession of Victoria, and a supplementary charter affiliating additional colleges was issued in 1850. In 1858 a new charter gave graduates rights as part of the corporate body of the university in an assembly called convocation. By this charter, too, the university degrees were given solely by examination. In 1863 the university was empowered to grant the degrees of B.Ch. and M.Ch.

By the supplementary charter of 1867 examinations for women were instituted, and by virtue of the Reform Act of that year the university has since returned one member to Parliament. In 1878 the university admitted women to degrees. By virtue of the University of London Act of 1898, a royal commission was appointed to reorganize the university completely, while still preserving its corporate continuity. In the years 1900–01 this work was completed, and the new corporation, coördinating and controlling the higher education of London into a *universitas litterarum*, began its labors. This new university comprises, in addition to its examining functions, a considerable number of schools previously more or less independent as teaching bodies. Of these, University College and King's College possess general faculties, six are theological schools, four are faculties of arts or sciences or both, three are women's colleges, 15 are medical colleges, and others include technological and agricultural institutions and the London School of Economics and Political Science. The Imperial College of Science and Technology is associated with the university.

The senate is the supreme governing body of the university. It consists of 54 members. The officials of the university are a chancellor, a vice chancellor, a chairman of convocation, a principal, and a representative in Parliament. The senate has three standing committees of prime importance—the academic council, the council for external students, and a board to promote university extension. The convocation of the university consists of the chancellor, the vice chancellor, the members of the three committees of the senate who are not graduates, and the graduates of the university. There are the following faculties: theology, arts, law, medicine, music, science (including veterinary science and agriculture), economics and political science (including commerce and industry), and engineering, each choosing its own dean. There are, further, 34 boards of studies, named by the senate, and a large body of examiners chosen by that same body. The university did not, as was first planned, become a teaching body save in so far as the various teaching bodies incorporated with it are under its supervision and to some extent its control, and in so far as its attention to secondary education and its work in university extension may be so regarded. It retains its private function of an examining board granting degrees. Degrees are granted purely by examination (save in the case of medicine) as follows: in arts and medicine, bachelors' and masters' degrees are given; in science, law, and music, bachelors' and doctors' degrees; and in literature, the doctors' degree. Examinations are held in London, in the provinces, and even in the colonies.

As this scheme has proved inadequate for the needs of higher education of London, a Royal Commission was appointed in 1909 under the chairmanship of Lord (then Mr.) Haldane to consider the whole question. The commission issued its final report in 1913 and made the following recommendations: The government of the university and especially the financial administration should be intrusted to a small senate, predominantly lay in character. The control of teaching and examinations in the colleges should be in the hands of the teachers. The educational and financial control of the constituent colleges should be vested in the university; as much university work and administration as possible should be concentrated in a central university quarter; and access to the examinations of the university should be continued to external students. Plans are proceeding for a reorganization along these lines. In 1913–14 there were, besides the appointed teachers paid out of the university fund, 1078 recognized teachers (teachers appointed and paid by the schools of the university and recognized as of university rank), 4740 internal and 1100 registered external students. Consult *London University Calendar* for history and organization. See UNIVERSITY, *English Universities*.

LONDON WALL. The Roman wall built in the fourth century by Constantine, inclosing the Roman colony of London. Its western end was at the site of the present Tower, whence it followed the line of the Minories, Houndsditch, and the street now called London Wall, to Aldersgate Street, and southward by Newgate to Ludgate to the Thames, which it reached in the neighborhood of Blackfriars Bridge. In recent times the wall has almost entirely disappeared, but portions may be seen in London Wall and in the churchyard of St. Giles, Cripplegate. The gates in the Roman wall afterward received names which are perpetuated in the names of streets which passed through them, as Newgate, Bishopsgate, Moorgate, etc.

LONE WOLF. A noted Kiowa chief, in 1866–79, and leader of the hostile element in the last outbreak in 1874. His name in his native language, Gui-pägo, was hereditary in his family. He succeeded to the head chieftainship in 1866, but was not among the signers of the Medicine Lodge Treaty the following year, by which the Kiowa agreed to come upon a reservation, and it was not until Custer, who had secured possession of him and Satanta after the battle of the Washita, threatened to hang them both that they consented to bring in their people in the spring of 1869. The several tribes party to the treaty continued restless, however, Lone Wolf himself being one of the most defiant, until a delegation, headed by him, was made up and proceeded to Washington in 1872 to adjust their differences. Some good result might have been effected, but unfortunately shortly after the return of the delegation Lone Wolf's favorite son and nephew were killed while raiding into Mexico. On this he swore vengeance and, going down into Mexico with a small party, brought back the bones of his son for burial, returning just in time to head the war element of the Kiowa in the outbreak of the Southern tribes in the summer of 1874. His first encounter with the troops occurred at the agency at Anadarko, August 22. From that time the campaign was pressed vigorously under General Mackenzie until the spring of 1875, when, one after another, the hostile chiefs, including Lone Wolf, came in and surrendered. Seventy warriors, including Lone Wolf and 25 other Kiowa, were selected for deportation to Florida, where they were held as prisoners at Fort Marion until May, 1878, when the survivors were returned to their tribes. He died the next year, having previously conferred his name and succession upon his adopted son, the present chief of that name.

LONG. A stock-exchange term. See STOCK EXCHANGE, *Stock-Exchange Terms*.

LONG, CRAWFORD W. (1815–78). An American surgeon, probably the first to use ether anæsthesia in surgery. He was born in Danielsville, Ga., graduated from Franklin College (now the University of Georgia) in 1835, and from the medical department of the University of Pennsylvania in 1839. Having learned from a pupil, Wiltshire, of the insensibility produced in apothecaries' clerks by inhaling ether vapor for amusement, Long experimented upon himself, and in March, 1842, administered ether to James Venable and during the patient's unconsciousness excised a tumor from his neck. In the same year and in 1845 Long operated upon three other patients, under ether, but did not report his cases or publish his observations. In 1846, while Long hesitated, Morton, at Jackson's suggestion, made his first public demonstrations and published his repeated successes to the world. Consult Paget, "Anæsthetics: The History of a Discovery," in *Nineteenth Century* (London, 1879). See Anæsthetic; Morton, W. T. G.; Wells, Horace.

LONG, George (1800–79). An English classical scholar. He was born at Poulton in Lancashire, England, and was educated at Trinity College, Cambridge, where he obtained the Craven scholarship in 1821. Long became senior chancellor's medalist in 1822 and subsequently fellow of his college. In 1824 he accepted the professorship of ancient languages in the University of Virginia, but returned to England in 1828, to become professor of the Greek language and literature in London University. This office he resigned in 1831, when he began to edit the *Journal of Education*, published by the Society for the Diffusion of Useful Knowledge. He edited for 11 years (from 1832 to 1843) the *Penny Cyclopædia*, to which he also contributed. Long joined the Inner Temple and was called to the bar in 1837. In 1846 he was chosen by the benchers of the Middle Temple to deliver a three years' course of lectures on jurisprudence and civil law. In 1849 he became professor of classical literature in the Proprietary College at Brighton, which appointment he held till 1871. Long was one of the best classical editors that England has produced; he was also one of the first authorities on Roman law. His merits as a translator are evinced in his *Selections from Plutarch's Lives, Thoughts of Marcus Aurelius,* and his *Discourses of Epictetus.* Long also contributed to Smith's Classical Dictionaries, especially the articles on Roman law to the *Dictionary of Greek and Roman Antiquities;* edited Cicero's *Orations* for the *Bibliotheca Classica* (1851–62), a series described as the first series to produce in English scholarly editions of the Classics, and Cæsar's *Gallic War;* and published an *Analysis of Herodotus, France and its Revolutions, Decline of the Roman Republic* (5 vols., London, 1864–74), etc. Consult J. E. Sandys, *A History of Classical Scholarship,* vol. iii (New York, 1908).

LONG, John Davis (1838–1915). An American public official, cabinet officer, and author, born at Buckfield, Me. He graduated at Harvard in 1857, studied law at Harvard Law School and in private offices, and in 1861 was admitted to the bar. From 1875 to 1878 he was a Republican member of the Massachusetts General Court, serving as Speaker (1876–78); in 1879 he was elected Lieutenant Governor; and from 1880 to 1883 he was Governor. He was an able executive and a polished speaker. He served as a member of Congress from 1883 to 1889, declining a renomination in 1888. Defeated as a candidate for the Senate in 1889, he remained out of public life until, eight years later, he was appointed by President McKinley Secretary of the Navy. In this office he encouraged and fostered an agitation for a larger naval armament. His able administration of the department during the trying period of the Spanish-American War was an important service to the country. In 1902 he resigned and returned to private practice. He became president of the board of overseers of Harvard University. Besides translating the *Æneid* in blank verse (1879), he edited *The Republican Party: Its History, Principles, and Policies* (1898; new ed., 1900), and, with others, *American Business Encyclopædia and Legal Adviser* (5 vols., 1913), and wrote *The New American Navy* (2 vols., 1903).

LONG, John Harper (1856–). An American chemist. He was born near Steubenville, Ohio, graduated from the University of Kansas in 1877, and studied at Tübingen (Sc.D., 1879), Würzburg, and Breslau. At Northwestern University he became professor of chemistry in 1881 and dean of the School of Pharmacy in 1913, after 1885 serving also as chemist of the Illinois State Board of Health. In 1903–04 he was president of the American Chemical Society. His publications include: *Laboratory Manual of Physiological Chemistry* (1894); *Elements of General Chemistry* (1898; 4th ed., 1906); *Text-Book of Analytical Chemistry* (1898; 3d ed., 1906); *Text-Book of Urine Analysis* (1900); *Text-Book of Physiological Chemistry* (1905; 2d ed., 1909).

LONG, John Luther (1861–). An American novelist, born in Pennsylvania. He was admitted to the bar and divided his time between the practice of his profession in Philadelphia and literary labors. His books include: *Miss Cherry-Blossom of Tôkyô* (1895); *Madam Butterfly* (1898); *The Fox-Woman* (1900); *The Prince of Illusion* (1901), short stories; *Heimweh and Other Stories* (1905); *The Dragon Fly,* a play, written with E. C. Carpenter (produced, 1905); *Billy Boy* (1906); *The Way of the Gods* (1906); *Felice* (1908); *Baby Grand* (1912), short stories; and *War—or What Happens When One Loves One's Enemy* (1913). *Madam Butterfly* was turned by David Belasco into a play in which Blanche Bates starred with great success, and the story inspired Puccini to write his famous opera.

LONG, Stephen Harriman (1784–1864). An American engineer and explorer, born at Hopkinton, N. H. After graduation at Dartmouth in 1809, he became a teacher. In 1814 he was appointed second lieutenant U. S. A., in the Corps of Engineers, from 1814 to 1816 was assistant professor of mathematics at the United States Military Academy, and in 1816 was brevetted major. In the latter year he made a survey of the Mississippi and its branches and soon after led an expedition from the Mississippi to the Rocky Mountains, one of the highest peaks of which bears his name. He was the first to suggest the application of the rectangular trussed frame to bridges and was extensively employed in the improvement of rivers and harbors. In 1861 he was appointed chief of topographical engineers with rank of colonel and in 1863 retired from the army. His *Railroad Manual* (1829) was the first original work of the sort published in the United States. Consult W. H. Keating, *Narrative of an Expedition to the Source of St. Peter's River, Lake Winnepeck, Lake of the Woods, etc., Performed in the Year 1823* (2 vols., London, 1825).

LONG, Walter Hume (1854–). An English politician, born at Bath and educated at Harrow and at Christ Church, Oxford. He sat in Parliament from various constituencies after 1880. He was Parliamentary Secretary to the Local Government Board from 1886 to 1892, President of the Board of Agriculture from 1895 to 1900, President of the Local Government Board from 1900 to 1906, and in 1905–06 Chief Secretary for Ireland. In the general elections of January, 1906, he was defeated at Bristol, but was chosen from Dublin as a representative of Ulster interests. After 1910 he represented the Strand division.

LONG'ACRE, James Barton (1794–1869). An American engraver, born in Delaware Co., Pa. He served an apprenticeship in Philadelphia under George Murray and first made a name with his fine plate of Andrew Jackson after Sully. He was afterward for many years engaged in engraving portraits and illustrating important American books. He prepared (for a time with James Herring) the *National Portrait Gallery of Distinguished Americans* (3 vols., 1834–39), many of the engravings in which were made from his own sketches. His portraits are faithful likenesses, executed with much color and life. He worked mostly in stipple, but that he also understood line engraving is shown in his portrait of Charles Carroll after Harding. In 1844 he was appointed engraver of the United States Mint, a post he retained until his death.

LONGAN, lŏŋ'gan (Neo-Lat. *longanum,* from Chin. *lung yen,* dragon's eye), *Nephelium longana.* An evergreen tree and its fruit, which is smaller than and inferior to its close relative the litchi (q.v.). The tree which produces it is a native of southeastern Asia and is generally cultivated in China and other Eastern countries.

LONG'BOAT'. A term not now much used, but formerly applied to the largest boat carried by a merchant vessel and answering to the sailing launch or pinnace of a man-of-war. It was used in transporting heavy cargo when boats from shore were not to be had and in making long trips over rough or open water unsuited to boats of less size. It was fitted with masts, sails, and oars, and in the event of shipwreck was usually large enough to contain all or nearly all of the officers and crew. It was too large to be carried at ordinary davits and was hoisted in amidships and stowed on deck.

LONG BRANCH. A city in Monmouth Co., N. J., 30 miles in a direct line and 45 miles by rail south of New York City, on the Atlantic Ocean, on the South Shrewsbury River, and on the Pennsylvania and the Central of New Jersey railroads (Map: New Jersey, E 3). During the summer months steamboats also ply regularly to New York, and electric roads connect with places near by, running through a picturesque district. Before the Revolution the land in the vicinity of Long Branch, which was settled about 1670, was owned by a British officer, Colonel White, who passed his summers here. In 1788 several families from Philadelphia began coming for a part of each summer, and in 1790 the place was improved and exploited as a summer resort, soon becoming exceedingly popular. The fine hotels, large boarding houses, beautiful cottages, numerous bathing houses, public parks, and casinos, afford accommodation for thousands of people during the heated season. The bluff overlooking the sea, along which extend a splendid boulevard and a 2-mile board walk, is protected by a system of massive bulkheads and jetties. The bluff and beach are owned by the city. There are two free reading rooms and circulating libraries and the Monmouth Memorial Hospital. The city is governed by five commissioners elected by the people, under the Commission Government Act adopted in May, 1912. Pop., 1890, 7231; 1900, 8872; 1910, 13,298; 1914 (U. S. est.), 14,719; 1920, 13,521.

LONG BRIDGE. A bridge over the Potomac River, connecting Washington with the Virginia shore. During the Civil War it was the chief line of communication with the Army of the Potomac and was strongly fortified.

LONGCHAMP, lôɴ'shäɴ', **William de** (?–1197). Bishop of Ely and Chancellor of England. He was a deformed Norman of low birth, once described by Henry II as "the son of two traitors." He had won the confidence of Richard before he ascended the throne and was made by him Chancellor of the Kingdom and Bishop of Ely (1190). When the King left England in 1190, he appointed Hugh of Durham and Longchamp joint justiciars, and a year afterward Longchamp was made papal legate. He quarreled with Hugh, ousted him from office, and made himself very unpopular in England by his taxations and haughty disregard of the wishes of the people. Many of the nobles supported John Lackland, with whom he also quarreled, and Longchamp was finally obliged to leave the country. He joined Richard, who was imprisoned in Germany, and by him was placed in charge of the collection of the ransom and hostages demanded by the Emperor. When the King returned to England in 1194, Longchamp was reinstated as Chancellor. He died at Poitiers on his way to Rome as Envoy to the Pope. Despite the universal dislike of him in England, Longchamp was an able ruler and always remained devoted to Richard's interests. Consult Louis Boivin-Champeaux, *Notice sur Guillaume de Longchamp* (Evreux, 1885).

LONGCHAMPS, lôɴ'shäɴ'. A part of the Bois de Boulogne, the site of an abbey founded in 1260 by Isabel, sister of St. Louis, and increased and enriched by successive kings. By the sixteenth century the early rigor of the Franciscan nuns who occupied the convent had degenerated into disorder and license, and Longchamps became a home for nuns of high family who cherished a love for the world within the precincts of the cloister. The abbey became a favorite resort for the *beau monde* of Paris, who went there during Holy Week to hear the Tenebræ sung by ladies from the opera. Archbishop Beaumont, just before the Revolution, caused the churches to be closed; the abbey was suppressed in 1792. But people, nevertheless, continued to drive to Longchamps for pleasure, and at the present day it is the favorite promenade of the Parisians and the site of their finest race track. In 1871 Emperor William reviewed here the troops designated to march on Paris.

LONG-CRESTED JAY. See Jay.

LONGE, lŭnj. A local name in New England for the lake trout. See Namaycush.

LONG-EARED OWL. See Owl.

LONG EATON. A town in Derbyshire, England, 7 miles southwest of Nottingham, noted for its lace manufactures and railroad-carriage works. Pop., 1901, 13,000; 1911, 19,207.

LONGEVITY, lŏn-jĕv'ĭ-tĭ (Lat. *longævitas,* from *longævus,* aged, from *longus,* long + *ævum,* age). The length or duration of life in the individual is an uncertain quantity, obviously dependent on manifold environmental circumstances. Each species of plant or animal, as in the case of each individual, has its term of existence, its limit of growth, and the duration of life organisms is extremely variable. The natural life of an ephemera is often spanned by four or five hours; that of the baobab tree of the Cape de Verde Islands by 5000 years. The duration of life has quite a different meaning from that of the prolongation of life by artificial means or by special care and under peculiarly favorable surroundings.

In plants, annuals (more truly semiannuals) live but a few months, growing up in spring and dying down, after seeding, in the autumn; biennials die at the end of the second year, while perennials may exist many years. Trees, even of the same order, vary greatly in duration of life; the fir, which is of rapid growth, may decay and die in about 20 years, while the spruce may grow for 150 years. Hufeland states that great age in plants depends (1) on slow growth; (2) it must propagate slowly and late in life; (3) it must have a certain degree of solidity and hardness in its tissues; (4) it must be large and have a considerable extent of surface; and (5) it must rise into the atmosphere. Hildebrand shows that the duration of life in plants is by no means completely fixed, and that it may be very considerably changed through the agency of the external conditions of life. He points out the fact that in course of time, and under changed conditions of existence, an annual plant may become perennial, or vice versa. That longevity depends on the environment, especially temperature, is also proved by the fact observed in botany that in certain genera of plants there are species which are annuals in the temperate zone, while there are other species in the tropics that are treelike and live many years.

Great age in animals is by no means confined to the higher vertebrates. A specimen of sea anemone (*Actinia mesembryanthemum*) lived in an aquarium in Edinburgh from 1828 to Aug. 4, 1887. In the Roman fish ponds lampreys were reputed to have reached their sixtieth year. The crocodile lives a century and continues to grow till it dies; pike and carp are said to have lived 150 years; eagles, falcons, and crows, a century. A white-headed vulture in the Schönbrunn Zoölogical Gardens is known to have been in captivity for 118 years. The smallest singing birds live 10 years, while the nightingale and blackbird survive 12 to 18 years. It is supposed that eider ducks may reach the age of nearly a century. Of mammals, only man, the elephant, and the whale live to be 100 years old. The horse and bear rarely reach an age of 40 years, the lion 35, the wild boar 25, the sheep 15, the hare 10, and the squirrel and mouse 6 years. As Weisman states, the minimum duration of life necessary for the species is much lower than among birds.

Of crustacea, the crayfish is said to live 20 years; the queen of the honey bee lives one or two years, but has been kept for five, while Lubbock kept one female ant over 13 years and another nearly 15 years, which continued to lay fertile eggs throughout her life.

The initial and most fundamental cause of longevity in plants is the favorable nature of the environment, the external conditions of life, particularly temperature. It is most probable that this profoundly affects the duration of life in animals. See GROWTH; METABOLISM.

Another factor is heredity. It is well known that longevity runs in families, is hereditary, and that, although individuals who attain a great age may be exposed to the same exigencies of life as those who die young or in middle life, they outlive their generation. The longevity of man is usually given as 100 years, but there are many authentic instances of people reaching 108 years. Beyond that limit, however, cases are very rare.

The great majority of long-lived individuals have been of medium height and weight, of quiet, regular habits, moderate eaters and temperate drinkers or abstainers. Tobacco seems to play but small part. Women live longer than men, probably because after the child-bearing period they are less exposed to injury and disease than men. See LIFE, MEAN DURATION OF.

That the average length of human life has been nearly doubled within a few centuries is due to improved conditions of living, to the progress of civilization, and especially to improved sanitary conditions. Thus, the mean duration of human life in France at the close of the eighteenth century was 29 years; in the period from 1817 to 1831 the average rose to 39 years, and between 1840 and 1859 to 40 years. For England it has been from 39 to 43. For Massachusetts the average is about 40, and in New York City 33.3. The mean normal longevity may not be the same in all races. The negroes of Senegal develop earlier than the white man, but they are shorter-lived; yet, when reared in the United States, they live to a great age. This is another proof of the profound influence of the mode and general conditions of life on longevity.

There is also a close correspondence between the duration of life in the individual and that of the species. Most specific forms are comparatively short-lived. They have originated, flourished, and died out within the limits of a geological epoch; while what are called "persistent" forms, such as *Lingulella, Limulus, Ceratodus,* etc., have by reason of their great vitality outlived entire faunæ and endured for millions of years and are now flourishing in apparently undiminished vigor. See EXTINCTION OF SPECIES.

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LONG′FELLOW, HENRY WADSWORTH (1807–82). The most popular of American poets. He was born in Portland, Me., Feb. 27, 1807, and was the second son of Stephen Longfellow, a well-to-do lawyer of Portland, and Zilpah Wadsworth. Through his mother's family Longfellow was descended from John Alden and Priscilla

Mullens, whom he made famous in his poem "The Courtship of Miles Standish." His poetic gifts were evident while he was still in his teens. As early as 1820 he had printed verses in the Portland *Gazette.* In 1825 he was graduated in the same class with Hawthorne from Bowdoin College, Brunswick, Me., after a course marked by studiousness. He was immediately made professor of modern languages at Bowdoin, but was allowed to go to Europe for three years, to fit himself for his profession. In Europe, from 1826 to 1829, his life was passed in hard study in Paris, and in Italy and Spain. He was married in 1831 to Miss Mary Storer Potter, who died in 1835. Aside from a collection of juvenile poems, in 1826, and his translation of a French grammar for use in his classes, in 1830, his first literary work was the translation of the *Coplas de Manrique* (1833). The same year he published the first part of *Outre-Mer: A Pilgrimage beyond the Sea*, and the second part the following year (in book form, 1835), both rather stilted sketches of travel. In 1835 he resigned his chair at Bowdoin and went again to Europe for a year's study, in preparation for the Smith professorship of modern languages at Harvard, which had been held by George Ticknor, the historian of Spanish literature. From 1836 his residence was in Cambridge, where he first occupied and afterward owned the Craigie House, the headquarters of Washington during the operations about Boston in the War of Independence.

In 1838 his well-known "Psalm of Life" appeared in the *Knickerbocker Magazine* and the following year was published, with other poems, in *Voices of the Night.* The same year appeared *Hyperion*, a rather florid romance, the heroine of which was Miss Frances Appleton, of Boston, whom he married in 1843. In 1841 such poems as "The Wreck of the Hesperus," "The Skeleton in Armor," and "The Village Blacksmith," included in the volume *Ballads and Other Poems*, confirmed his literary reputation and made him perhaps the most widely read of American poets. In 1842 he again went to England and the same year published *Poems on Slavery.* It is sufficient to indicate the chief titles of his prolific later work: *The Spanish Student* (1843), a drama of no great merit; *The Belfry of Bruges, and Other Poems* (1846); *Evangeline: A Tale of Acadie* (1847), a very popular narrative pastoral in hexameter verse; *Kavanagh* (1849), a romance of better quality than *Hyperion; The Seaside and the Fireside* (1850), a volume of poems which included "The Building of the Ship"; *The Golden Legend* (1851); *The Song of Hiawatha* (1855); *The Courtship of Miles Standish* (1858), a narrative poem in hexameters; *Birds of Passage* (1858); *Tales of a Wayside Inn* (1863–73), a volume of narrative poems modeled on the *Canterbury Tales; Flower-de-Luce and Other Poems* (1867); a translation of the *Divine Comedy* of Dante (1867–70), in verse; *New England Tragedies* (1868), two dramas dealing with historical events of early New England; *The Divine Tragedy* (1871); *Three Books of Song* (1872); *Aftermath* (1873); *The Hanging of the Crane* (1874); *The Masque of Pandora* (1875); *Kéramos and Other Poems* (1878); *Ultima Thule* (1880); *In the Harbor* (1882); *Michael Angelo*, the fragment of a drama (1883). He also edited an anthology, the *Poets and Poetry of Europe* (1843), and *Poems of Places* (1876–79, in 31 vols.). During this time his private life had been uneventful, except for the loss of his wife, who by a tragic accident was burned to death in 1861. In 1854 he resigned his professorship at Harvard and thenceforward lived quietly in Cambridge until his death, on March 24, 1882.

In appearance Longfellow was of medium stature and had rather pronounced, heavy features, cast in a mold of benignity. Kindliness was one of the chief traits of his character. As a teacher and writer, he was always conscientious and industrious. He numbered among his personal friends the most famous writers and statesmen of New England, as Emerson, Hawthorne, Lowell, Holmes, Whittier, and Sumner.

Poems of Longfellow's such as the "Psalm of Life" and "Excelsior" have gone to the heart of the American public, and ballads such as "The Wreck of the Hesperus," "The Skeleton in Armor," and "The Norman Baron" are on the tongue of many a schoolboy. One secret of his success lies in his rare gifts as a popularizer of ideas and of culture. This office manifests itself in two ways. He has given, in the first place, expression to the general and commonplace emotions of American civilization of the better sort, with its simplicity, its plain aspiration, and its lack of subtlety. Such are his poems on slavery, which express the feeling any humane man might have at the mention of the word, but which, though they served a good purpose in their day, lack the fire and deep emotion of Whittier's poems upon the same theme. The "Psalm of Life," "The Building of the Ship," and "The Village Blacksmith" are the melodious phrasing of thoughts and feelings dear to the heart of the average man. Akin to these are the large number of poems, of which "Hiawatha," "Evangeline," "The Courtship of Miles Standish," and "Paul Revere's Ride" may be taken as examples, dealing with American life in a quasi-historical and narrative way.

In the second place, Longfellow did much to open the eyes of Americans to the beauty of European life and to initiate them into European culture. Indeed he may be said to have done as much as any other American to spread the culture of modern literature in his own land. This he did in verse much more widely than by his actual teaching as Smith professor of modern languages. About half of this verse deals directly with scenes, legends, and stories of European civilization. Longfellow sincerely loved beauty and romance wherever it was to be found, and the pleasant sentiment of such poems as "The Belfry of Bruges" or the narratives of the *Tales of a Wayside Inn* did much to awaken a corresponding glow in the hearts of his countrymen. His service to American scholarship in his translation and annotation of Dante's *Divine Comedy* was great.

Longfellow is justly popular as the poet who, above all other poets of his country, has expressed with a varied and finished art the simple, natural, elemental affections and sentiments. He is surpassed by other Americans in various ways, as by Emerson in profundity and subtlety, by Lowell in vigor and wealth of ideas, by Holmes in wit, by Bryant in stateliness, by Poe in sense of form and beauty; but in general artistic sense, in taste, in kindliness, in moral sensitiveness, he stands above the rest. He has been called superficial, his poetry academic, his prose rhetorical, but he is certainly one of the most widely diffused forces in the emotional and spiritual life of Americans, and indeed in all English-speaking countries his verse is well liked. In his narrative poems he possesses a freshness and vigor that deserve high praise, and he is often really inspired when dealing with the sea. The most exacting criticism would cull from his lyric poems a group which are of very high excellence.

Bibliography. The work of Longfellow is definitively published in the Riverside Edition in 11 volumes (Boston, 1886–90). The chief sources for his biography are the *Life of Henry Wadsworth Longfellow* (Boston, 1886), by his brother, the Rev. Samuel Longfellow, and the same editor's *Final Memorials of Henry Wadsworth Longfellow* (Boston, 1887). These two books were later gathered in three volumes of memoirs. Consult also: Robertson, in the "Great Writers Series" (London, 1887), and the critical articles in the literary histories, such as E. C. Stedman, *The Poets of America* (New York, 1885); Richardson, *American Literature* (ib., 1887–88); T. W. Higginson, *Old Cambridge* (ib., 1900); Wendell, *A Literary History of America* (ib., 1900); W. D. Howells, *Literary Friends and Acquaintances* (ib., 1900); G. R. Carpenter, *Henry Wadsworth Longfellow*, in the "Beacon Biographies" (Boston, 1901); C. E. Norton, *Longfellow* (ib., 1907); Bliss Perry, *The Centenary of Longfellow* (ib., 1908); L. S. Livingston (comp.), *Bibliography of the First Editions in Book Form of the Writings of Henry Wadsworth Longfellow* (New York, 1908); W. P. Trent, *Longfellow and Other Essays* (ib., 1910).

LONGFELLOW, Samuel (1819–92). An American Unitarian clergyman and hymn writer. He was born at Portland, Me.; graduated at Harvard College in 1839 and at Harvard Divinity School in 1846; became pastor of a church in Fall River, Mass., in 1848, and of the Second Unitarian Church in Brooklyn, N. Y., in 1853; resigned the latter charge in 1860 and went abroad. On his return to America he fixed his residence at Cambridge, Mass., and continued to preach in Unitarian pulpits, in 1878 becoming minister of the Unitarian Church in Germantown, Pa. This pastorate he resigned in 1882 to return to Cambridge. He contributed essays to *The Radical* (1866–71) and published, besides several volumes of hymns and poems, a *Life* of his brother, Henry Wadsworth Longfellow (2 vols., 1886), and *Final Memorials of Henry Wadsworth Longfellow* (1887). Consult his *Memoir* by Joseph May (Boston, 1894).

LONGFELLOW, William Pitt Preble (1836–1913). An American architect, nephew of Henry Wadsworth Longfellow. He was born at Portland, Me. After graduating from Harvard University in 1855, he was assistant architect of the United States Treasury Department in 1869–72, adjunct professor of architectural design at Massachusetts Institute of Technology in 1881–82, and chairman of the architectural section of the board of judges at the Chicago Exposition in 1893. He served as the first editor of the *American Architect*. His published works include: *Abstract of Lectures on Perspective* (1889); *Cyclopædia of Architecture in Italy, Greece, and the Levant* (1895; new ed., 1903); *The Column and the Arch: Essays on Architectural History* (1899); *Applied Perspective* (1901).

LONG′FIN′. A name given to the fish *Caprodon schlegelli*, and in New South Wales to *Anthias longimanus*, remarkable for a great extension of one of the middle rays of each pectoral fin.

LONG′FORD. An inland county of the Province of Leinster, Ireland, lying between Leitrim and Cavan on the north, Westmeath on the east and south, and Roscommon on the west; area, 421 square miles (Map: Ireland, D 4). The soil is poor and in many places marshy; lands devoted to grazing predominate over arable lands. The industries include the manufacture of woolens and linen. The capital is Longford. The population, which constantly decreases owing to emigration, was in 1841, 115,590; in 1901, 46,600; in 1911, 43,820, of whom 90 per cent are Roman Catholic.

LONGFORD. The capital of County Longford, Ireland, 75 miles west-northwest of Dublin, on the Camlin (Map: Ireland, D 4). It is a well-built town, connected with Dublin and Sligo by rail and also with the former by the Royal Canal. It is the seat of the Roman Catholic Bishop of Ardagh and Clonmacnois, and the cathedral, a spacious, magnificent building of the Italian composite order, is considered one of the finest modern churches in Ireland. There is also a Roman Catholic college. There are manufactures of brick and some trade in agricultural products. Pop. (urban district), 1901, 3747; 1911, 3760.

LONGFORD, Joseph H(enry) (1849–). A British Orientalist. He was educated at Queen's College, Belfast, and in 1869 entered the British consular service in Japan. He lived there for 33 years, as student interpreter, Consul, the judge of consular courts in different Japanese cities. In 1903 he became professor of Japanese at King's College, London. Longford wrote valuable consular reports, especially on Japanese industries; a summary of the Japanese penal codes (in the *Transactions* of the Asiatic Society of Japan for 1877); *Japan*, in "Living Races of Mankind" (1905); *The Story of Old Japan* (1910); the particularly valuable *Story of Korea* (1911); *Japan of the Japanese* (1911); a brief "Cambridge manual" on *The Evolution of New Japan* (1913); and a supplement to his revision of R. K. Douglas's *Europe and the Far East* (1913).

LONGHENA, lôn-gā′nȧ, Baldassare (1604–82). The last of the great architects of the late Renaissance in Venice; the artistic successor of Giacopo Sansovino, Andrea Palladio, and Vincenzo Scamozzi. (See articles on these artists.) His long life corresponds with the period known in Italian architectural history by the various names of Baroque, Jesuit, Borrominesque, etc.; a period characterized in general by a great decline in purity of taste and by extravagance, ostentation, and sensationalism in architecture and sculpture and in decorative design generally. Amid this prevalent artistic debasement Longhena maintained the purer traditions bequeathed him by the illustrious succession of great Venetian architects above named. His works are singularly correct and free from sensationalism, considering their period, and yet not without a certain opulence of effect and grandeur of scale. The first of these appears to have been the Palazzo Pesaro (1644–50), in which the style of Giacopo Sansovino, as exemplified in the Libreria di San Marco and the Palazzo Cornaro on the Grand Canal, is frankly followed. To the same date belong the monastic buildings (but not the church and campanile) of San Giorgio Maggiore, with a specially fine staircase. The Palazzo Rezzonico, completed in 1686 after his death, is a sober design of great dignity. His masterpiece was the great domical church of Santa Maria della Salute (1631–56).

LONGHI, lôṉ′gê, Giuseppe (1766–1831). An Italian painter and line engraver. He was born at Monza, in October, 1766, and was a pupil of Vicenzo Vangelisti at the Brera in Milan and of Giulio Travellesi, a Florentine painter. He also studied in Rome, where he came under the influence of Raffaello Morghen. On his return to Milan he gave considerable time to miniature painting. He became professor in the Academy of the Brera in 1798 and had many distinguished pupils. Napoleon gave him a commission for an engraving of his portrait by Gros and a portrait of Michelangelo Buonarotti; also the illustrations for a beautiful work, *Fasti di Napoleone il Grande*, after designs by Appiani. The work was never completed, but there are six fine plates by Longhi. He died at Milan, Jan. 2, 1831. Among his best-known engravings are: "Bonaparte at Arcole," after Gros; "Good Samaritan"; "The Philosopher"; "Old Man"; "Laughing Negro," after Rembrandt; "St. Joseph Carrying the Infant Jesus," after Guido Reni; "The Beheading of St. John the Baptist," after Gerard Dou; "Genius of Music," after Guido Reni, in the Chigi Palace; portraits of Washington, Appiani's Napoleon as King of Italy, Francis I of Austria, and Eugène Beauharnais after Gérard. He wrote a *Life* of Michelangelo (1816) and *Teoria di calcografia* (Milan, 1830). Consult his biography by Sacchi (Milan, 1830), and Beretta (ib., 1838).

LONGHORN. See Cerambycidæ; Longicorn.

LONG HOUSE. See Iroquois.

LONGICORN, lŏn′jĭ-kôrn, or Long-Horned Beetle. A beetle of the family Cerambycidæ (q.v.), remarkable for its very long antennæ. They are moderate, sometimes of large size, elongated form, and usually bright colors. They are beetles of the forests and are especially fitted for climbing, especially when larvæ. The fleshy, short-legged grubs bore into wood and feed there, injuring fruit and timber trees.

A LONGICORN.

LONGINUS, lŏn-jī′nŭs. The Latin name sometimes used by the Polish historian Jan Dlugosz (q.v.).

LONGINUS (Lat., from Gk. Λογγῖνος), Dionysius Cassius (c.213–273 A.D.). A Platonic philosopher and rhetorician. He was born, according to some, at Emesa in Syria, or, according to others, with more probability, at Athens. In his earlier years he traveled a great deal in the company of his parents and made the acquaintance of many celebrated scholars and philosophers. He studied Greek literature at Alexandria, where he was for a considerable time the pupil of Ammonius, Plotinus, and Origen, and subsequently settled as a teacher of rhetoric in Athens, where he soon acquired a great reputation. His knowledge was immense, but his taste and critical acuteness were no less wonderful. He was probably the best critic of all antiquity. In an age when Platonism was giving place to the semi-Oriental mysticism of Neo-Platonism, Longinus is conspicuous as a genuine disciple of the great master. Clear, calm, rational, yet lofty, he despised the fantastic speculation of Plotinus, who consequently would not admit that Longinus was a philosopher, but—since he stooped to criticize the diction and style of Plato—pronounced him a mere philologist. In the latter years of his life he accepted the invitation of Zenobia (q.v.) to undertake the education of her children at Palmyra; but, becoming also her chief political adviser, he was beheaded as a traitor, by command of the Emperor Aurelian, 273 A.D. Longinus was a heathen, but generous and tolerant. His philological writings dealt with Homer, with questions of Attic vocabulary, etc.; his most important work in this field was his Φιλόλογοι Ὁμιλίαι, *Discourses Philological*, in 21 or more books. In the philosophical field he wrote Περὶ Ἀρχῶν, *On First Principles*, Περὶ Τέλους, *On the Chief End* (cf. the title used by Cicero, *De Finibus*). Of the greater part of his works only the barest fragments have survived. A very important and valuable work, entitled *On the Sublime*, or, as Jebb would rather render, *On Impressiveness of Style* (Περὶ Ὕψους), was attributed to Longinus by its first editor, Robortello (Basel, 1554), and was accepted as his without question by all subsequent editors until the nineteenth century. The controversy has not been finally settled, but it is believed by many that the treatise belongs rather to the first century A.D. Consult, for the arguments, Roberts, *Longinus on the Sublime* (2d ed., Cambridge, 1907), and Saintsbury, *History of Criticism and Literary Taste in Europe*, vol. i (New York, 1900). The treatise has been edited by Vahlen (Bonn, 1887), and by Roberts, with an English translation in the book above quoted. There is also an English translation by Havell and Lang (London, 1890). Prickard produced a text edition and later an English translation (Oxford, 1907–08). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1908).

LONGINUS, Gaius Cassius. A noted Roman jurist of the first century A.D. He became Governor of Syria in the reign of Claudius and maintained a high degree of discipline and efficiency in the troops of that province. Subsequently at Rome he aroused by his high position of respect and influence the suspicions of Nero, who banished him to Sardinia. He was recalled by Vespasian. His *Libri Juris Civilis*, 10 in number, and his commentaries on Uresius Ferox and Vitellius are quoted in the *Digest* and held high rank among legal works.

LONG ISLAND. A fish-shaped island, forming the extreme southeastern part of New York State (Map: New York, B, C 2). Its eastern end is formed of two flukelike peninsulas, Orient Point and Montauk Point, which inclose both Great Peconic Bay and Little Peconic Bay, as well as Gardiner's, Robins, and Shelter islands. The width of the island varies from 15 to 23 miles; the extreme length, measured to Orient Point, is 118 miles; the area is 1682 square miles; and the highest point is Harbor Hill at Roslyn, which is 391 feet above the sea. Long Island was the most thickly settled part of New York State down to the time of the Revolution, and with the Hudson River plantations was the granary of New York City all through the Colonial period, just as it is now often called New York's vegetable garden. The census of 1910 gave it over 2,000,000 people, or a little less than one-fourth the population of the State.

The western part of the north shore is deeply indented by long, narrow, fiord-like bays that lie between broad, flat-topped peninsulas, of which the most notable are Manhasset Bay and Oyster Bay, Cold Spring Harbor and Hempstead Harbor. The eastern part has been smoothed by wave action and exhibits blunt spurs joined by smooth beach ridges. The outer shore on the south is smooth throughout, consisting of long, regular sand reefs separated by inlets. Thus, Fire Island and Oak Island Beach are separated by Fire Island Inlet, Short Beach and Long Beach by Jones Inlet, and Rockaway Beach and Coney Island by Rockaway Inlet. The ragged inner shore is formed on the edge of a salt marsh. Between the inner and outer shores are large lagoons such as Jamaica Bay, Great South Bay, Moriches Bay, and Shinnecock Bay. Jamaica Bay has been partly surveyed with a view to its development into a great marine basin which may relieve the pressure upon the crowded port of New York. Some of these huge lagoons are connected by narrow straits, and at the eastern end a canal has recently been dug connecting Peconic Bay on the north side of the Montauk peninsula, and Shinnecock Bay on the south. A long interior route is thus afforded for boats of light draft.

In contrast to the stony and shallow soils of the mainland, the soils of Long Island are deep, and many of them are entirely free from stones. Like the topography, the soils are due chiefly to glacial action. Upon a basement of southward-sloping sands and clays (Cretaceous and Tertiary) the great continental ice sheet of the glacial age deposited terminal moraines and a narrow till sheet. The moraines stretch eastward from East River as narrow ranges of hills —one along the north shore to Orient Point, the other through the centre of the island to Montauk Point. Each is marked by many minor irregularities (a "knob-and-hollow" topography) and by a number of lakes. The largest of these is Ronkonkoma, about 75 feet deep, whose bottom is from 5 to 10 feet below sea level, and about whose character and origin a number of curious Indian legends have grown up. The popular idea of its underground connection with the watersheds of Connecticut rivers is wholly fantastic. Each moraine is also fronted by smooth outwash plains, formed of thick deposits of sand and gravel. The moraines are clayey on the west and sandy on the east. They are also more or less stony throughout, while large parts of the flat outwash plains have "neither stick nor stone," to use the exaggerated statement of Colonial travelers. The outwash plains include the largest tract of true prairie in the eastern United States. It lies south of the southern moraine and chiefly between Farmingdale and Jamaica. These plains are also noted for their extensive stands of scrub oak, stunted oak, and pitch pine in contrast to the mixed hardwoods that extend over the western half of the morainic belt. Towards the east a number of boom towns have been laid out on these flat plains, streets surveyed and named, and development houses built, but it will be long before there is real occupation of a region of so little scenic or agricultural value.

The western portion of the plains lies near New York City, and its value is therefore greatly enhanced by nearness to a good market. It is one vast vegetable garden. According to the United States Department of Agriculture, it is the most intensively cultivated and productive tract of land in the eastern United States. The value of the fertilizers and labor expended upon a farm in a given year, to produce three or four short-term crops in succession, not infrequently exceeds one-half the purchase price of the land. It is the most striking case of its kind in the whole country. The important thing is not the amount of plant food in the soil, but the convenient market nearby. The soil, naturally rather poor, though flat and friable, is merely a medium for transforming fertilizers and water into vegetables. To these advantages of location is added an unusually favorable climate for early vegetables. The temperature seldom falls below zero or rises above 90°, owing to the moderating influence of the sea. Snow rarely lasts more than a few days, and the spring temperatures are at least five degrees higher than those of the mainland.

The first important railway from Brooklyn was extended to Greenport in 1844 and for a few years was part of the most convenient route to Boston. The completion of the south-shore railway of the present New York, New Haven, and Hartford System left Greenport to one side of the main line of travel in New England. The history of railway building and operation from that time down to a recent date was one long series of bankruptcies, owing to the limited tributary areas and the fierce competition of many local lines. The rapid rise of the summer business, the increased train facilities, and the consolidation of the railways into the Long Island Company, and their later incorporation into the Pennsylvania System, have now changed all this. Finely built automobile roads extend like a network over the island and greatly increase the spread of population and the enjoyment of its unusual natural advantages. The aviation field at Garden City, the race course at Sheepshead Bay, and the golf links at Garden City and Shinnecock have gained an international reputation. The summer homes are distributed chiefly along the summit of the morainic hills that border the north shore and along the edge of the flat plains on the southern border of the island. The one situation is desirable for its beautiful views across Long Island Sound to the Connecticut shore; the other for its access to the great bays and the fine beaches where surf bathing has become a popular form of recreation. The south shore is now occupied largely by summer hotels on the west and partly by fishing stations on the east.

At the time of its discovery by Hudson in 1609, Long Island was occupied by 13 tribes of the Lenni-Lenape division of Algonquin Indians, who are now represented by a few individuals of mixed blood dwelling near Shinnecock Neck, Forge, and Montauk Point, where, at the period of the first European settlement, Wyandance, the chief of the 13 tribes, resided. The Indians appear to have had regular seasonal migrations.

They spent their summer months chiefly in shell fishing and in making their celebrated wampum, stolen in almost yearly raids by the plundering Iroquois and by them transmitted to trading neighbors who distributed it as far west as the Missouri headwaters. In the winter months they lived in the forested interior near their cultivated grounds and engaged in hunting deer and other game. Antiquarian discoveries have demonstrated the existence of a prehistoric race of different origin. The various Indian names of the island were Sewanhacky, Panmancke, Matouwacks, and Wamponomon. The Dutch named it Lange Eylandt—whence Long Island; a subsequent change by the Colonial Legislature to the Island of Nassau never became popular. Included in the land between the Atlantic and Pacific oceans, embraced by lat. 40° to 48° N., granted by James I to the Plymouth Company in 1620, it became the property of the Earl of Stirling and at his death, in 1640, of the Duke of York. The earliest settlements by the Dutch were begun in 1632; the first recorded purchase of land in South Brooklyn is in 1636. The Dutch exercised jurisdiction in the western part of the island down to 1664, in which year they were dispossessed of New Netherland. Many of the agricultural holdings towards the east remain unchanged in the possession of descendants of the original settlers; Gardiner's Island has belonged to the family of that name since 1640. The military operations during the Revolutionary period and the battle of Long Island (q.v.) are the chief incidents of the subsequent history of the island.

Bibliography. Thompson, *The History of Long Island* (New York, 1843); Prime, *History of Long Island* (ib., 1845); Furman, *Antiquities of Long Island, with Bibliography* (ib., 1875); Flint, *Early Long Island* (ib., 1896); Bonsteel, J. A., *Soil Survey of the Long Island Area, New York* (Washington, 1904); Veatch and others, *The Underground Water Resources of Long Island, New York* (United States Geological Survey, ib., 1906); Harper, *A Natural Prairie on Long Island* (Bulletin of the American Geographical Society, New York, 1911); Bowman, "Long Island," in his *Forest Physiography*, part ii (ib., 1911); and the annual reports of the Long Island Historical Society (Brooklyn).

LONG ISLAND, BATTLE OF. A battle fought on Brooklyn Heights, Long Island, N. Y., Aug. 27, 1776, during the Revolutionary War, between a British force of more than 15,000 under General Howe and an American force of about 8000 under the immediate command of Gen. Israel Putnam. The British, landing at a point of Long Island a short distance below the Narrows, marched by three routes against the American position, which had been strongly fortified in anticipation of an attack, Brooklyn Heights being necessary to the British if they were to succeed in their plans for the capture of New York. The most important road, the Jamaica Road, leading to the American position, seems to have been left almost wholly unguarded, and it was by this that the British advanced in greatest force. Parts of the American army under Gen. William Alexander (Lord Stirling) and General Sullivan, stationed in advance of the principal American fortification, were defeated after some stubborn fighting, both Alexander and Sullivan being captured; and Howe then proceeded to invest the works. In the evening of the 27th Washington crossed over to Long Island and on the following day brought over reënforcements. General Howe showing no disposition to storm, however, Washington decided to abandon the works and transfer his forces to Manhattan Island, and during the night of August 29–30 this was successfully effected, the British not suspecting the movement until the Americans had crossed in safety. During the battle more than 1000 Americans were taken prisoners. The British and American losses in killed, wounded, and missing were nearly the same, about 400. Consult: H. B. Dawson, *Battles of the United States* (New York, 1858); T. W. Field, *Battle of Long Island* (Brooklyn, 1869); H. B. Carrington, *Battles of the American Revolution* (ib., 1876); H. P. Johnston, *Campaign of 1776 around New York and Brooklyn* (Brooklyn, 1878); E. M. Raye-Smith, *The Battle of Brooklyn* (New York, 1913); F. G. Mather, *The Refugees of 1776 from Long Island to Connecticut* (Albany, 1913); and the critical article by C. F. Adams, "The Battle of Long Island," in *American Historical Review* (New York, 1896).

LONG ISLAND CITY. Formerly a city in Queens Co., N. Y. (in the district bordering East River and north of Newtown Creek), now included in the Borough of Queens, New York City (Map: New York City, E 5). There are extensive manufacturing interests, including drug and chemical works, stone and marble works, and manufactories of paper products, automobiles, automobile trucks, buttons, etc. It also contains the factories of two widely known makes of pianos and a large biscuit factory. As a result of the rapidly increasing transportation facilities now being projected by the city of New York, the locality is fast becoming a place of great industrial and commercial importance. It is the eastern terminal and division headquarters of the Long Island Railroad and contains many of the Queens Borough offices. Long Island City was first settled by the Dutch as early as 1640. The city was formed in 1870 by uniting the villages of Blissville, Hunter's Point, Astoria, Ravenswood, Dutch Kills, and Steinway under one municipal charter, although the community which these villages comprised was known as Long Island City for two decades prior to this. In 1871–72 a commission headed by Gen. W. B. Franklin laid out the city. Consult Kelsey, *History of Long Island City* (Long Island City, 1896).

LONG ISLAND HISTORICAL SOCIETY. An association in Brooklyn, N. Y., organized in 1863 for the purpose of furthering a knowledge of American history, primarily as connected with the history of Long Island. It maintains a reference library, rich in American local and family history, and a fine museum of the flora, fauna, minerals, antiquities, and historical relics of the island. The society has published a number of valuable works, among them *Dankers and Sluyters Voyage to New York in 1679–80*, two volumes on the Battle of Long Island, one containing the hitherto unpublished letters of George Washington on agricultural and personal topics, and the Town Records of Old Jamaica (three volumes). Its library comprises 80,000 volumes and many valuable manuscripts.

LONG ISLAND SOUND. A narrow arm of the Atlantic Ocean, separating Long Island from the mainland of New York and Connecticut

(Map: New York, B, C, 2). It is about 76 miles long (from Little Gull Island to Execution Rocks), and its greatest width, nearly abreast of New Haven, is somewhat more than 16 miles. At the western end it narrows into the strait known as East River (q.v.), which separates Manhattan from Brooklyn and Queens boroughs, New York City, and opens into New York Bay. It is separated from Block Island Sound, on the east, by a chain of small islands, the main channel, which is between Fisher's Island and Gull Island, being called the Race. The Connecticut, Housatonic, Thames, and Mystic rivers flow into Long Island Sound from the north. The Connecticut shore is rocky, skirted by reefs; that of Long Island is more easy of approach, and there are many moderately good and one or two excellent harbors. The narrow and rock-bound passage in the East River known as Hell Gate made this route unavailable for large vessels until the work of removing the rocks was completed by the United States government in 1885. (See HELL GATE.) The entrance to the East River is guarded by Fort Schuyler, on Throgg's Neck.

LON'GITUDE. See LATITUDE AND LONGITUDE.

LONG'JAW'. 1. A name about the Gulf of Mexico for a needlefish (q.v.) of the genus *Tylosaurus.* 2. In the Great Lakes, a whitefish (*Argyrosomus prognathus*), resembling the cisco, but larger; it is also called bloater. See AGUJA.

LONGLEY, lŏng'lĭ, CHARLES THOMAS (1794–1868). Archbishop of Canterbury. He was born in Rochester, England, was elected a King's scholar at Westminster School in 1808, and graduated at Christ Church, Oxford, in 1815. He became perpetual curate of Cowley in 1823; rector of West Tytherly, 1827; head master of Harrow School, 1829; Bishop of Ripon, 1836; of Durham, 1856; Archbishop of York, Privy Councilor, 1860; and Archbishop of Canterbury, 1862. In 1867 he presided at the sessions of the Lambeth Conference (q.v.). He opposed the Ritualistic movement and in 1838 suppressed teachings and practices regarded as Roman Catholic in St. Saviour's Church, Leeds. In the House of Lords he generally acted with the Liberal party; but he opposed the Oxford University Reform Bill of 1854, the Divorce Bill of 1857, and motions for the revision of the Prayer Book, the modification of the Act of Uniformity, and the alteration of the Burial Service. His published works include addresses and sermons, of which the most important perhaps is the one delivered at the opening of the conference in 1867, and an English version of Koch's *Tableau des révolutions de l'Europe* (1831).

LONGLEY, JAMES WILBERFORCE (1849–1922). A Canadian journalist and statesman, born at Paradise, Annapolis Co., Nova Scotia, of Loyalist descent. After graduating at Acadia College, Wolfville, he studied law in Halifax and Toronto, was called to the bar in 1875, and became Queen's Counsel in 1890. He began his newspaper work on the staff of the *Acadian Recorder* (1873), but left it for the Halifax *Morning Chronicle*, of which he was managing editor from 1887 to 1891. He was elected a Liberal member of the local House for his native county in 1882, was chosen a commissioner to revise the provincial laws, entered the Executive Council in 1884, was Attorney-General in 1884–96 in the cabinet of W. S. Fielding (q.v.), and in 1896–1905 was Commissioner of Crownlands in the cabinet of G. H. Murray (q.v.). He was instrumental in passing the bill abolishing imprisonment for debt (1890). He was appointed a puisne judge of the Supreme Court of Nova Scotia in 1905. His publications include: *Socialism: Its Truths and Errors; Canada and Imperial Federation; Religion in the Nineteenth Century; Joseph Howe* (1904), in the "Makers of Canada Series."

LONG'MAN, (MARY) EVELYN BEATRICE (1874–). An American sculptor. She was born at Winchester, Ohio, studied painting at Olivet College and sculpture (under Taft) at the Art Institute, Chicago, and from 1901 worked in New York as assistant to Daniel C. French. Her first important piece was a male statue, "Victory," in the Festival Hall at the St. Louis Exposition (original plaster, Chicago Art Institute; bronze replica, Union League Club), for which she was awarded a silver medal. In 1906 she won the $20,000 competition for the bronze doors of the Naval Academy Chapel at Annapolis. These doors, executed in low relief, are remarkable for beauty of line and balance of composition. The bronze doors of Wellesley College Library, and the Storey Memorial in Lowell Cemetery are further examples of her relief work. A three-figure finial group for the Foster Mausoleum at Middleburg, N. Y., and a torso in the Metropolitan Museum are among her best statues. Her finely characterized portrait busts include: "Enigma," "John Stewart Kennedy," and "Louise." Her work is refined, strong, and well composed, and she excels in the use of ornament. She became associate of the National Academy and a member of the National Sculpture Society.

LONG'MANS. An English family of book publishers, founded by Thomas Longman (1699–1755). He was apprenticed, when 17 years of age, to a London bookseller named John Osborn, whose daughter he afterward married. In 1724 he bought out the business of John Taylor (who published the first edition of *Robinson Crusoe*) and set up for himself on the site which in the twentieth century was still the location of the publishing house he founded. His father-in-law soon joined him, and together they conducted the business until the former's death, when Thomas again became sole director. He was very successful, and was interested in a number of books which were not only good business investments at the time, but which have achieved an enduring reputation, among them David Hume's *Treatise of Human Nature* and Dr. Johnson's *Dictionary.* He was succeeded by his nephew, Thomas Longman (1730–97), whom he had taken into partnership, and who not only extended the business in England, but carried on a considerable trade with America. The second head of the firm was succeeded on his death by his son, Thomas Norton Longman (1771–1842), who in 1794 received Owen Rees into partnership. During this period the Longmans acquired many valuable copyrights, including Lindley Murray's *English Grammar,* the *Lyrical Ballads* of Coleridge and Wordsworth, Scott's *Lay of the Last Minstrel,* and Moore's *Lalla Rookh.* They also published a number of very profitable encyclopædias and in 1826 became sole proprietors of the *Edinburgh Review.* Several new partners were admitted during these years, and the title of the firm changed to

Longman, Hurst, Rees, Orme, Brown, and Green. Thomas Norton was succeeded by his sons, Thomas (1804–79), who became head of the firm on his father's death in 1842, and William (1813–77), who was an author as well as a publisher. His writings dealt chiefly with travel and history, and included a *Journal of Six Weeks' Adventures in Switzerland, Piedmont, and on the Italian Lakes* (1856); *A History of England to the Close of the Reign of Edward II* (1869); *A History of the Life and Times of Edward III* (1869). During this administration the firm published a sumptuous edition of the New Testament, illustrated with wood engravings after paintings by famous artists. It also acquired the copyrights to a number of famous books, including the works of John Stuart Mill and Disraeli's novels, and it published Lord Macaulay's works, giving him as part payment for the third and fourth volumes of his *History of England* a check for £20,000. Thomas Longman was succeeded by his sons, T. N. Longman, who became head of the firm, and G. H. Longman. William Longman was succeeded by his son, Charles James Longman, who graduated at University College, Oxford, and in 1882 became editor of *Longman's Magazine*. In 1890 the Longmans took over all the publications of Rivington. Under its present style of Longmans, Green & Co., the family control is maintained, represented by Thomas Norton Longman and Thomas Longman.

LONGMONT, lŏng′mŏnt. A city in Boulder Co., Colo., 42 miles by rail north of Denver, on the Chicago, Burlington, and Quincy, the Colorado and Southern, and the Great Western railroads (Map: Colorado, D 1). It contains a public library, a high school, and a hospital, and in the vicinity are Estes Park, Long's Peak, the St. Vrain River Cañon, and the Colorado National Park. Among the industrial plants are sugar refineries, flour mills, grain elevators, brick and tile works, a creamery, a silo factory, and a malt and barley plant. The city owns and operates its water works and light and power plant. Pop., 1900, 2201; 1910, 4256.

LONG-NECKED TURTLE. A turtle of the genus *Chelodina*, of which several species inhabit Australia and New Guinea. The neck is as long as the shell and in the typical species (*Chelodina longicollis*) measures about 10 inches and is of snakelike appearance and flexibility. The sternum of this species is peculiarly broad and oval in front, and the shields of it are surrounded by a dark edge. The shields of the dorsal disk are very thin and veined. This turtle, like all the other species of the genus, hides its head under the side of the shell when oppressed, and does not withdraw it into the shell as most other tortoises. A South American genus (*Hydromedusa*) has an even longer neck in proportion to the shell. The name is sometimes applied to the entire family (*Chelydidæ*) to which these turtles and the quaint matamata belong.

LONGNON, lô′nyôɴ′, AUGUSTE HONORÉ (1844–1911). A French scholar and historian, born in Paris. He learned the trade of a shoemaker and practiced it until 1869, after he had become in 1868 a student at the Ecole des Hautes Etudes. He published his *Livre des vassaux du comté de Champagne et de Brie, 1192-1222* and the first volume of the *Etudes sur les Pagi* in 1869, and the following year received an appointment in the Imperial archives. From 1875 he directed the *Bulletin* of the Historical Society of Paris and Ile de France; he became professor (1879) at the Ecole des Hautes Etudes and later director, member of the Academy of Inscriptions and Belles-Lettres (1886), of the Legion of Honor (1887), and professor of historical geography at the Collège de France (1892). Besides an edition of Froissart's *Méliador* (1895–99), Longnon published *Etudes sur les Pagi de la Gaule* (1869–72); *Rôles des fiefs du comté de Champagne et de Brie* (1871); *Etude biographique sur François Villon* (1876); *Pouillé du diocèse de Cahors* (1869); *Géographie de la Gaule au VIème siècle* (1878), his chief work, which gained the Gobert prize from the Academy of Inscriptions; *Paris sous la domination anglaise, 1420–1436* (1879); *Documents sur l'iconographie de St. Louis* (1881); *Atlas historique de la France* (1884–1907); *Polyptyque de l'abbaye de Saint-Germain des Prés* (new ed., 1886–99); a critical edition of the *Œuvres de F. Villon* (1892); and *Documents relatifs au comté de Champagne et de Brie, 1172–1361* (1901–08). Consult the excellent obituary by Monod, in *Revue Historique*, vol. cviii (Paris, 1911).

LONGOBARDS, lŏṉ′gō-bärdz. See LOMBARDS.

LONGOMONTANUS, lŏṉ′gō-mŏn-tā′nŭs *or* -tä′nṳs, CHRISTIAN SÖRENSEN (or SEVERIN) (1562–1647). A Danish astronomer, born at Longberg in Jutland. He was educated at Viborg, studied under Tycho Brahe after 1589, and received a master's degree at Rostock. He was rector of the grammar school at Viborg in 1603–05 and afterward was professor at the University of Copenhagen. There he founded the observatory in the "Rundetaarn" (round tower), which he described in *Introductio in Theatrum Astronomicum Havniense* (1639). His other works include: *Systematis Mathematici* (1611); *Disputatio de Eclipsibus* (1616); his most important work, *Astronomia Danica* (1622); *Inventio Quadraturæ Circuli* (1634); *Caput Tertium Libri Primi de Absoluta Mensura Rotundi Plani* (1646).

LONG PARLIAMENT. The famous fifth Parliament of Charles I, which met Nov. 3, 1640, having been summoned for the purpose of raising supplies to carry on war against his rebellious Scottish subjects. It impeached and executed Strafford (q.v.) and Laud (q.v.), abolished the Star Chamber (q.v.) and the High Commission (q.v.), sheared other courts of their arbitrary powers, declared ship money to be illegal, prohibited the collection of tonnage and poundage without parliamentary grant, abolished compulsory knighthood, provided for the delimitation of the royal forests, regulated purveyance, passed a Triennial Act (q.v.), and provided against its dissolution or prorogation without its own consent. The members were unanimous in most of these constitutional reforms, but they speedily divided into parties upon the question of the reorganization of the English church, the Cavaliers supporting the King and the bishops. The Irish insurrection of 1641 necessitated the raising of an army, and the dispute as to its control led (1642) to the Civil War, in which the Parliament was successful against the King. In order to secure the support of the Scots, it adopted the Solemn League and Covenant (see COVENANTS) and introduced Presbyterianism (see CREEDS AND CONFESSIONS), the Cavalier members having withdrawn on the outbreak of the war. The army, however, had become the stronghold of the Independents, whom the Parliament was anxious to crush by force. In order to be free to disband the army, Parliament made such concessions to Charles in the Treaty of Newport (1648) as seemed to the army a surrender of the results of the war. The army therefore interfered and expelled by force about 96 Presbyterian members, leaving 50 or 60 members, afterward known as the Rump (q.v.), which executed the King and established the Commonwealth, but was in turn expelled by Cromwell in 1653. During the disorders which followed Cromwell's death the Rump was recalled for a short time in 1659 and again in December of the same year, to which the expelled Presbyterian members were added on Feb. 21, 1660. The Long Parliament thus restored issued writs for a new election and voted its own dissolution on March 16, 1660. Consult: *Parliamentary History* (36 vols., London, 1806–20); G. B. Smith, *History of the English Parliament* (ib., 1892); C. H. Firth, *Oliver Cromwell and the Rule of the Puritans in England* (New York, 1900); S. R. Gardiner, *The Great Civil War* (4 vols., 1901); F. C. Montague, *The History of England from the Accession of James I to the Restoration* (London, 1907). See Charles I; Cromwell, Oliver.

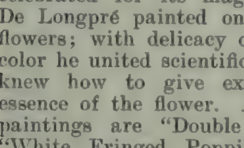
LONGPRÉ, Charles Lemercier de. See Haussez, Baron d'.

LONGPRÉ, Paul de (1855–1911). A French flower painter, active chiefly in the United States. He was born at Lyons, France, and was entirely self-taught. From his twelfth year he practiced successfully in Paris as a painter of fans. At 21 he first exhibited at the Salon. Having lost his money by the failure of a Paris bank, he removed in 1890 to New York and in 1896 held an exhibition of flower pieces which secured him instant recognition. In 1899 he removed to California and two years later built a beautiful home at Hollywood, which became celebrated for its magnificent flower gardens. De Longpré painted only perfect specimens of flowers; with delicacy of touch and feeling for color he united scientific knowledge, and he also knew how to give expression to the subtle essence of the flower. Among the finest of his paintings are "Double Peach Blossoms" and "White Fringed Poppies" (1902), which are widely known through popular reproductions.

LONG PRIMER. See Printing.

LONG'SHANKS. A nickname of King Edward I of England.

LONG'SPUR. The longspurs are gregarious, terrestrial finches, having exposed nostrils and the hind claw unusually long and nearly straight, like a spur. Four of these finches occur in the United States, of which three are endemic, while one is circumpolar. This last is the Lapland longspur (*Calcarius lapponicus*) and breeds only in the highest latitudes; in winter it ranges southward, in America as far as Pennsylvania, Ohio, and Colorado, but is uncommon in the eastern United States even in severe winters. As usually seen in winter, the upper parts are mixed black, rufous, and buff, the nape yellowish buff, the underparts white, the breast and sides streaked with blackish and yellowish buff. In the fully plumaged male the head, neck, and breast are black.



FOOT OF LONGSPUR.

The three distinctively American longspurs are easily distinguished from the Lapland longspur and from each other when in adult summer plumage, but in immature and winter plumage they bear considerable resemblance to each other. The painted longspur (*Calcarius pictus*) breeds in the valleys of the Yukon, Mackenzie, and Saskatchewan rivers, but in winter ranges south and east as far as Illinois. The chestnut-collared longspur (*Calcarius ornatus*) is the best known of the American species, as it breeds in great numbers on the prairies of Dakota and Montana. Its nest is a scanty collection of grass and weed stalks in a hollow on the ground, and the eggs, usually four, are white with purplish and brown markings. None of the longspurs are really singers, the notes, though pleasing, being weak and twittering. The last of the four species, sometimes called black-breasted longspur (*Rhynchophanes mccowni*), differs from the preceding trio in the much stouter bill and the shorter and more curved hind claw. It is quite different also in appearance when in breeding plumage, but its habits, nest, eggs, and song are not essentially different. It occurs during the summer from Colorado northward to the valley of the Saskatchewan, but does not pass west of the Rocky Mountains nor east of the Mississippi River; in winter it ranges from Colorado southward into Mexico. Consult American ornithologies, and especially Elliott Coues, *Birds of the Northwest* (Washington, 1874).

LONG'STREET, Augustus Baldwin (1790–1870). An American lawyer, educator, and humorist, born in Augusta, Ga., Sept. 22, 1790. He graduated at Yale (1813) and practiced law in Georgia, becoming a district judge in 1822 and holding the office for several years. He then resumed practice and did editorial work in Augusta, where he established the *Sentinel*, soon merged with the *Chronicle* (1838). He became a Methodist minister and in a year was made president of Emory College (1839). After nine years he accepted the presidency of Centenary College, Louisiana, then of the University of Mississippi. After six years in the last position he resigned and became a planter, but was tempted by the presidency of South Carolina College (1857), and in a few years he was back again at his old presidency in Mississippi. He had a great sectional reputation as a speaker and as a vehement States'-rights man, and he was a voluminous writer. His fame is based, however, on a single book, *Georgia Scenes*, originally published in newspapers, then gathered into a volume at the South, and finally issued in New York in 1840. It is said that he disowned the second edition (1867) and tried to destroy the first. He died in Oxford, Miss., Sept. 9, 1870.

LONGSTREET, James (1821–1904). A distinguished Confederate general in the American Civil War. He was born in Edgefield, S. C., removed to Alabama with his parents in 1831, graduated at the United States Military Academy in 1842, and was afterward stationed at various places on the Western frontier. In the Mexican War he served with distinction in both the Northern and Southern campaigns, received the brevet of captain and major for gallantry at Contreras and Churubusco and at Molino del Rey, and was severely wounded in the assault upon Chapultepec. Afterward he served chiefly on the Texas frontier, becoming paymaster in 1858. At the outbreak of the Civil War he resigned his commission in the United States army and entered the Confederate service with the rank of brigadier general. He participated with distinction in the first battle of Bull Run and was made major general in 1862. In the first part of the Peninsular campaign he commanded Joseph E. Johnston's rear guard during the retreat before McClellan. He took part in the Seven Days' Battle and the second battle of Bull Run, where his opportune arrival and masterly generalship were instrumental in securing the victory over Pope. (See Bull Run, Second Battle of.) After the battle of Fredericksburg, in which he commanded the Confederate left and repulsed Burnside's gallant but foolhardy attacks (see Fredericksburg, Battle of), he was promoted to a lieutenant generalship. At Gettysburg, after having strongly opposed Lee's plans before the battle and having advocated the interposing of the Confederate army between the Federal Army of the Potomac and Washington—a policy which he believed would force Meade to fight on disadvantageous terms—he commanded the right wing of the Army of Northern Virginia, thus directing, under Lee, the most stubborn fighting in that three days' conflict, including the famous charge of Pickett. He has been charged with tardiness at getting into action. (See Gettysburg, Battle of.) He then was transferred to the Army of Tennessee under Gen. Braxton Bragg (q.v.), and at the battle of Chickamauga (q.v.), by making an opportune attack, he was instrumental in carrying the day. After undertaking an unsuccessful movement against Burnside, who occupied a strong position at Knoxville, he joined Lee in Virginia early in 1864. He took a distinguished part in the Battles of the Wilderness, where he was severely wounded. He recovered in time, however, to command the First Corps of the Army of Northern Virginia during the second half of the year 1864. General Longstreet enjoyed the distinction of being one of the greatest fighters of the Confederacy and possessed the unbounded confidence and affection of his soldiers. After the close of the war he engaged in business as a cotton factor in New Orleans, where he later became a Republican in politics, and from 1869 to 1873 held the office of Surveyor of Customs at the Port of New Orleans under General Grant. His alignment with the Republican party and the controversy over the responsibility for the Gettysburg failure served to diminish his popularity in the South for a time. Later he held the offices of Supervisor of Internal Revenue in Louisiana and Postmaster at New Orleans. In 1875 he removed to Georgia, and in 1880–81 was in Turkey as United States Minister. In 1898 he was appointed United States Railway Commissioner. He published a valuable work, entitled *From Manassas to Appomattox* (Philadelphia, 2d ed., 1904). Consult H. D. Longstreet, *Lee and Longstreet at High Tide* (Gainesville, Ga., 1904).

LONG′SWORD. A surname of William the Conqueror.

LONG-TAILED HUMMER. A humming bird (*Aithurus polytmus*) of Jamaica, remarkable for the male having the feathers of the tail next the outermost on each side three times as long as the other rectrices and curved so that they cross near their centres. The head is provided with a long black crest. This bird is very common in Jamaica, where many may sometimes be seen about a flowery bush, opening and shutting the long feathers of the tail with beautiful effect. The nest is composed of silk cotton, the outside quite covered with spiders' webs, and built of lichens and bark. See Colored Plate of Humming Birds.

LONG′TON. A town of Staffordshire, England, in the potteries district, 2 miles southeast of Stoke, on a tributary of the Trent (Map: England, D 4). Queen's Park, a beautiful recreation ground, belongs to the municipality. Its growth was due to the manufacture of china and earthenware, and the presence of rich iron and coal mines in the neighborhood. It was incorporated in 1865; in 1884 its boundaries were enlarged; in 1910 it surrendered its charter and became part of the borough of Stoke-on-Trent (q.v.) under the Potteries Federation Scheme. Pop., 1901, 35,800; 1911, 37,479.

LONGUEUIL, lôɴ′gẽ′y′. A town and the capital of Chambly Co., Quebec, Canada, on the right bank of the St. Lawrence, opposite Hochelaga, the east ward of Montreal city, and on the Quebec, Montreal, and Southern, and the Montreal and Southern Counties railways (Map: Quebec, E 5). It is a popular summer resort and is much frequented for boating and bathing and contains the homes of many Montreal citizens. It contains a college and two Roman Catholic convents. Among its manufacturing establishments are a large steel plant, a saw mill, and a foundry. The town owns its electric-lighting plant and water works. Pop., 1901, 2835; 1911, 3972.

LONGUEUIL, Sieur and Baron de. See Le Moyne, Charles.

LONGUEVILLE, lôɴg′vêl′, Anne Geneviève de Bourbon-Condé, Duchess of (1619–79). A noted leader of the Fronde (q.v.) during the minority of Louis XIV of France. She was born in the donjon of Vincennes, where her father, Henry II of the Bourbon, was a prisoner. She was the sister of the great Condé and the Prince de Conti. In 1642 she became the wife of the Duke de Longueville, an old roué. She was a woman of singular beauty and charm, and among her many admirers was the Duke de la Rochefoucauld, author of the *Maximes*, who exercised a marked influence upon her character and developed the political ambition which thereafter directed her career. She became one of the leading spirits in the first Fronde, although it was overthrown by her own brother. When her husband and brothers were arrested and imprisoned by the Queen Regent, Anne of Austria, in January, 1650, she attempted to bring about a rising in Normandy against Mazarin, but failed. She made her escape and went to Stenay, where she induced Turenne to turn against the court and compel the release of the prisoners. For a short time she returned to the social circle that gathered at the Hôtel Rambouillet; but her brothers, Condé and Conti, having again broken with the Mazarin government, she joined them at Bourges and Bordeaux. The party, however, fell asunder, and the Duchess returned to Paris, pardoned through the efforts of her husband. After the death of the latter, in 1663, she lived in seclusion. She retired to the convent of the Carmelites, was a friend of the Jansenists, and when their persecution was renewed, it was under her roof that the "great Arnauld" found shelter. Consult the admirable studies of Victor Cousin, *The Youth of Madame de Longueville*, translated from the French (New York, 1854); id., *Madame de Longueville pendant la Fronde* (3d ed., Paris, 1867); A. Cock, *The Life of Madame de Longueville (Anne Geneviève de Bourbon)* (New York, 1899); H. N. Williams, *A Princess of Intrigue, Anne Geneviève de Bourbon, Duchesse de Longueville, and her Times* (2 vols., London, 1907).

LON'GUS (Lat., from Gk. Λόγγος) (flourished probably at end of second century A.D.). A Greek writer, probably a native of Lesbos, the scene of his romance, *Daphnis and Chloë* (Δάφνις καὶ Χλόη), which is a story of shepherd life, and, although marred by some passages repulsive to modern taste, contains much that is charming and shows no small skill in the analysis of feeling. It enjoyed a great vogue, especially at the time of the Renaissance. It was edited by Hercher, *Scriptores Erotici Græci* (Leipzig, 1858), by Kiefer (ib., 1904), and by Lowe (Cambridge, 1908). An admirable translation into French was made by Amyot in 1559; another, remarkable for style, was prepared by Paul Louis Courier de Méré (q.v.). Courier used Amyot's translation and also had the benefit of the authoritative manuscript of the romance (published, Florence, 1598), which contains material unknown to the Renaissance. This manuscript Courier discovered about 1807 and twice edited (Rome, 1810; Paris, 1829). The story of Paul and Virginia (q.v.) shows the influence of Longus's romance. There is an English translation by Smith, *The Greek Romances of Heliodorus, Longus, and Achilles Tatius* (London, 1855). Consult also: *Daphnis and Chloë, The Elizabethan Version from Amyot's Translation by Angel Day: Reprinted from the unique original and edited by Joseph Jacobs* (London, 1890); Rohde, *Der griechische Roman*, pp. 531 ff. (3d ed., Leipzig, 1914); S. L. Wolff, *The Greek Romances in Elizabethan Prose Fiction* (New York, 1912), containing a bibliography.

LONG'VIEW. A city and the county seat of Gregg Co., Tex., 122 miles east of Dallas, on the Sabine River, and on the Texas and Pacific, the International and Great Northern, and the Texas and Gulf railroads (Map: Texas, E 3). It has lumber mills, crate and box factory, cottonseed-oil mills, foundry, and plow works, and carries on an important trade in lumber, live stock, hides, cotton, fruit, etc. A mineral well in the vicinity is noted for its medicinal properties. The water works and sewage system are owned by the city. Pop., 1900, 3591; 1910, 5155.

LONG WALLS OF ATHENS. The two parallel walls constructed 460–458 B.C. under Pericles, connecting Athens and the Piræus. Their construction was suggested by Themistocles, and Cimon is said to have begun their foundation. The northern wall was called the Piraic wall, the southern the Phaleric. They extended for a distance of 4½ miles between the two cities and ran parallel, 550 feet apart, branching out as they approached each town and joining the city walls. They thus made of Athens and the Piræus one city, impregnable as long as it retained its naval preëminence. After the Peloponnesian War Lysander is said to have had these walls, together with the wall of the Piræus, pulled down to the sound of the flute. They were restored by Conon, after the victory of Cnidus, and subsequently repaired at various times. They were finally demolished by Sulla. A third long wall has been assumed on the authority of a passage in Thucydides, but no trace of its course has ever been discovered, and the statement probably refers to the double Piraic wall. Consult E. A. Gardner, *Ancient Athens* (New York, 1902), and C. H. Weller, *Athens and its Monuments* (ib., 1913).

LONG'WORTH, Nicholas (1783–1863). An American horticulturist, born in Newark, N. J. When a young man, he became a banker and merchant in Cincinnati, but took active interest in agricultural subjects. Especially is he noted for his efforts to establish grape growing in the Ohio valley. So successful was he that he has been called the Father of American Grape Culture. Not only was he a pioneer and leading horticultural expert in his section, but he was recognized as an authority in national horticultural matters. His writings, though individually short and now out of date, exercised a wide influence in his day.

LONGWY, lôɴ'vē'. A fortified town, 1240 feet above the sea, in the Department of Meurthe-et-Moselle, France, 18 miles southwest of Luxemburg, near the Belgian frontier (Map: France, N., L 3). It consists of two parts—Longwy-Haut, the upper and fortified town above the river Chiers, commanding an extensive view; and Longwy-Bas, the lower town, with manufactures of jewels, gold ware, and porcelain works. In the vicinity are valuable iron mines. Longwy, called the Iron Gate of France, has belonged to that country since 1678; it was taken by the Prussians in 1792, in 1815, and in 1871. Longwy was the first French town attacked in the European War which began in 1914. It was captured after a resolute defense. See War in Europe. Pop., 1901, 9235; 1911, 9710.

LONIGO, lô-nē'gô. A district town in the Province of Vicenza, Italy, situated on the river Gua, 14 miles southwest of Vicenza. It has two interesting mediæval towers, a new Romanesque church, and a palace built by Palladio. The chief products are hemp, grain, wine, also manufactures of silk and leather. Pop., 1901, 10,403; 1911, 11,172.

LÖNNROT, lẽn'rōt, Elias (1802–84). A noted Finnish philologist, folklorist, and physician, born at Sammatti, in western Nyland. He was educated at Abo and Helsingfors, studied medicine and practiced for several years, but always devoted the best of his effort to linguistic study and to the collection of the old Finnish popular poetry. In 1853 he was appointed to the chair of Finnish in the University of Helsingfors, but resigned in 1862. After 1828, mostly alone and on foot, he had traveled through Finland, Lapland, Ingermanland, and northwestern Russia to gather songs, proverbs, riddles, fairy tales, etc., which he edited in splendid critical collections. Lönnrot collected and edited: *Kantele* (1829–31), containing ancient and modern folk songs; his main work, the great Finnish national epos, *Kalevala* (see Finnish Language and Literature) (1835), containing 32 songs and 12,000 verses (new ed., with 50 songs and 22,793 verses, 1849; fuller ed. by A. F. Forsman, 1887). To him, as collector, it owes its existence as an integral epic. He edited also a collection of minor lyrics, *Kanteletar* (3 vols., 1840; Ger. trans., 1882); Finnish proverbs, *Sanalaskuja* (1842); riddles, *Arvoituksia* (1844; 2d enlarged ed., 1851); incantations, *Loitsurunoja* (1880). He wrote: *Om det nord-tschudiska språket* (1853); *Flora Fennica* (1860); and the great work, *Finskt-svenskt lexikon* (2 vols., 1866–80). Consult: A. E. Ahlquist, *E. Lönnrot* (Helsingfors, 1884); D. P. A. Comparetti, *Il Calevala* (Rome, 1891; Ger. trans., Halle, 1892); Nervander, *Från E. Lönnrots Ungdomstid på Laukko* (Helsingfors, 1894); K. L. Krohn, *Kalevalan runojen historia*, history of the Kalevala poems (ib., 1903–10), the most important work on Kalevala.

LONS-LE-SAUNIER, lôɴ′-le-sô′nyȧ′. The capital of the Department of Jura, France, situated amid vine-clad hills on the Vallière, 76 miles by rail north-northeast of Lyons (Map: France, N., L 6). It has monuments to General Lecourbe, a native of the town, and Rouget de l'Isle, the author of the *Marseillaise*, born near Lons-le-Saunier. The town hall has collections of antiquities, sculptures, and paintings, and a library. A teachers' seminary, a girls' college, and a lycée are the chief educational institutions. The saline springs of the town, used since remote times for the production of salt, have been converted into a bathing establishment. In the vicinity are situated the extensive salt works of Montmorot. Lons-le-Saunier produces sparkling wine, salt, leather, cast iron, and machinery, and trades in agricultural and dairy products. The town is of Gallic origin and was known in ancient times as Ledo Salinarius. Pop., 1901, 12,935; 1911, 11,069.

LÓNYAY, lōn′yō-ĭ, Menghért, Count (1822–84). An Hungarian statesman, born in Nagy-Sonya of a noble Protestant family and educated in law at Pest. He was elected to the Diet when he was only 21 and became a member of the party of the Opposition, although he did not favor Kossuth's policy of a protective tariff. Undersecretary of State in the Finance ministry of 1848, he fled to Paris the following year, after the suppression of the insurrection. But he returned in 1850 under the provisions of a special amnesty and became especially interested in the reconstruction of Hungarian finance, the amelioration of economic conditions, and the settlement of the relations of church and state. He was especially prominent in procuring autonomy for the Protestant church in Hungary (1859). He became Hungarian Minister of Finance in 1867, Imperial Minister of Finance in 1870, and Hungarian Premier in 1871. In December, 1872, the Left forced him to resign. Three years later he became a member of the Upper House. Lónyay was president of the Hungarian Academy from 1875 to his death. He wrote various works on economics and finance.

LOO (abbrev. of *lanterlor*, the latter derived from F. *lantur(e)lu*, originally the meaningless refrain of a popular song of the seventeenth century). A game played with a full pack of ordinary playing cards, by any number of persons, preferably from five to seven. The common form is *three-card loo.* The dealer deals three cards, one at a time and face downward, to each player, and an additional three, called a miss, turning up the trump in the usual manner. The sum of the stake should be divisible by three, with no remainder, and the pool must be put up before the deal is completed. The player at the dealer's left, having looked at his hand, decides whether he will play, pass, or take miss. In the latter event he discards his hand, face downward, which he also does if he passes. When miss is taken, the other players may play or pass, but the taker of the miss must play. The play is one card at a time, and the cards have the same value as in whist, but the tricks are kept face upward. The leader must play the ace of trumps if he holds it, or the king if the ace is turned up; also, if he holds two trumps, he must lead one of them and must lead his ace or king, as before. If there are but two players, a leader who holds more than one trump must lead the highest. The players following the leader must follow suit with their highest card, or trump. Otherwise they may discard. The winner of the first trick is governed by the rules applying to the leader and must lead a trump if he holds one. Each player receives one-third of the amount of the pool for each trick he has won. If at least one trick is won by each player, a "single" is declared, and another pool is made as before; but a player is "looed" who fails to take a trick, and then he alone contributes to the next pool. Similarly, if more than one player is looed, each must ante. There are several variations of the game.

LOO, Van. A family of painters. The eldest was of Flemish origin, but he practiced in France, where the most celebrated member of the family was born. They are therefore usually known under the French form of the name, Vanloo (q.v.).

LOO-CHOO. See Luchu.

LOOFS, lōfs, Friedrich (1858–). A German Lutheran theologian, born at Hildesheim, Hanover. He studied at Leipzig, Tübingen, and Göttingen; was appointed a lecturer in Church history at Leipzig in 1882; received a professorship there in 1886; and in 1887 went to Halle, where he occupied the chair of Church history after 1888. His writings number: *Antiquæ Britonum Scotorumque Ecclesiæ* (1882); *Leitfaden zum Studium der Dogmengeschichte* (1889; 3d ed., 1893); *Predigten* (1892–1901); *Studien über die dem Johannes von Damaskus zugeschriebenen Parallelen* (1892); *Anti-Haeckel* (1900; 5th ed., 1906); *Grundlinien der Kirchengeschichte* (1901; 2d ed., 1910); *Symbolik I* (1902); *Nestoriana* (1905); *Vom Vorsehungsglauben* (1906); *Grundriss der Dogmengeschichte* (1907); *Akademische Predigten* (1908); *Das Glubensbekenntnis der Homousianer von Sardica* (1909); *Ueber Selbsterlösung, Pantheismus und Lebensfreude* (1911); *What is the Truth about Jesus Christ?* (1913); *Nestorius and his Position in the History of Christian Doctrines* (1914).

LOOK AND SAY METHOD. See Reading.

LOOK′DOWN. A name about Chesapeake Bay for the horsehead or silver moonfish (*Selene vomer*). See Moonfish.

LOOK′OUT, Cape. See Cape Lookout.

LOOKOUT MOUNTAIN, Battle of. See Chattanooga, Battle of.

LOOK UP LEGION. See Lend a Hand Clubs.

LOOM (AS. *ge-loma*, tool, instrument, frame). The frame that holds the warp threads parallel and taut for the weaver. The frame of *real-tapestry looms* consists of two rollers, the warp beam and the cloth beam, mounted several feet apart, on uprights in a high-warp loom and on horizontals in a low-warp loom. (See Tapestry.) As the weaving progresses the rollers are turned at intervals so that the finished cloth is wound up on the cloth beam and the warp threads unwound from the warp beam. This is the essential basis of nearly all looms, and from such a frame have been developed the most complicated damask, brocade, and lace looms. Simpler forms of the loom have the warp wound over crosspieces that do not revolve, or, as on the high-warp loom shown in the famous ancient Greek vase painting of Penelope and Telemachus, have the warps weighted at the lower end instead of attached to a roller. While the warp of parallel taut threads is an essential feature of all looms, the manner in which the weft or filling is interlaced with, or woven across, the warp varies greatly. In *real-tapestry* and on many primitive looms the bobbins on which the weft is wound are passed by hand. These are *bobbin looms,* as contrasted with *shuttle looms.* The shuttle is a pointed box or case carrying the bobbin, and devised in order to make it easy to throw or knock the weft the full width of the loom. In *bobbin looms* the weft is ordinarily passed only a short distance; in tapestries, only as far as the particular block of color extends. Bobbin looms are themselves divided into two important classes: *treadle looms* and those without a treadle. The latter are usually called *high-warp looms.* In high-warp looms the shed, or separation between the warps, is effected by pulling leashes with the left hand. In treadle or low-warp looms the separation of the warps is effected by leashes attached to treadles, thus making a hand-foot loom instead of an all-hand loom, and leaving the hands entirely free for the manipulation of the weft. Two treadles, however, divide the warps into only two groups, restricting the product of the loom to *plain weaves* only (see WEAVING), some flat like etamine, others ribbed like real tapestry. As the number of treadles is increased more separate warp groupings or combinations can be effected, and twills are produced without difficulty. But for damasks and complicated weaves still further invention was necessary. So the weaver was given an assistant who pulled cords controlling the different groups of warp threads. This is the *draw loom.* The *Jacquard attachment* described later is the machine that took the place of the *drawboy;* it is used on both hand and power looms when the warp combinations are complicated. Classified historically and by order of development the different types of loom are *bobbin, treadle, shuttle, draw, Jacquard,* and *power.*

In the ordinary *hand loom with shuttle,* illustrated in Fig. 1, two rollers, 1, 2, are placed one at each end of the *frame, AAAA,* so that they will readily turn on the axes; and from one to the other the threads of the warp, *X,* are stretched after having been drawn through the eyes of the *heddles, Z,* of the loom harness, *BC,* and the *reed,* which is a frame suspended from the batten, 3, and are kept tight by weights, *g, g.* If the cloth to be woven is to be a plain cloth—i.e., one in which every second warp thread is above the filling thread, while the alternate threads are below and the positions of the warp threads are reversed for the next filling thread—then two heddle frames or harnesses are required and the warp threads are drawn through the eyes of the heddles, threads one, three, five, etc., being arranged on the first of the two harnesses while the threads two, four, six, etc., are arranged on the second. After being drawn in the harness the threads are reeded—i.e., passed through the interstices of the *loom reed* in pairs, and the reed to be used is the one to give the correct number of warp threads wanted to the inch in the finished fabric; it will hold these threads at a uniform distance apart for the full length of the warp during the process of weaving. The *loom harness* is suspended from a roller, 5, placed at the top and near the front of the loom frame, and each is fastened to one of a pair of treadles, *DD,* directly beneath; the weaver depresses first one treadle, which pulls down the harness frame with which it is connected and simultaneously raises the second harness frame with its attached treadle, separating the warp threads and forming a *shed, S,* as above described. The shuttle is thrown through the shed either by the hand of the weaver or by a quick jerk imparted to it from the weaver's hand by a combination of straps and springs. After the shuttle has deposited the filling in the shed the reed, which is held firmly in a frame swinging from above, called a *batten,* 3, is forced quickly by the hand of the weaver pressing the filling in place; the second treadle is now depressed while the heddle frames reverse their former position, changing the relative position of the warp threads, and the shuttle is passed through the new shed and the filling is again beaten up.

In the eighteenth century a series of inventions started a revolution in the art of weaving. The first was a mechanical arrangement to throw the shuttle, instead of the weaver's hand. In 1733 John Kay, of England, invented a device known as the flying shuttle and picking stick, by which the shuttle received a blow and was driven through the shed, and after the shed had been changed was struck in a similar way at the other end and driven back. By this invention a much more rapid motion was obtained than was possible with the hand shuttle.

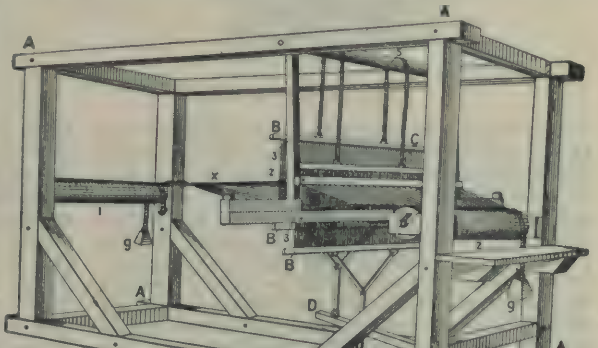


FIG. 1. HAND LOOM.

At the time of the introduction of the flying shuttle the loom was supplied with a *shuttle box* at each end of the *batten;* these *shuttle boxes* are receptacles which receive the shuttle as it is driven across and release it as it is driven back into the box at the opposite end; they are placed on a level with that part of the batten called the shuttle race and can receive but one shuttle at a time, so it is obvious that should the weaver wish to introduce more than one color of thread in the filling, the loom must be stopped in order to change shuttles for each change of filling. In 1760 Kay invented the *drop box*, an attachment consisting of a tier of shuttle boxes, one above the other. The several compartments of the drop-box attachment could be filled with shuttles, each containing a different color of filling, and when a certain color was wanted the box, or compartment, containing that color could be brought to the level of the shuttle race and the shuttle driven across and back until another color was wanted. The modern *box loom*, or loom having more than one box (as the *single-box* loom has) at each end of the *lathe*, as the batten is now generally called, may have two, four, or six boxes at one end and one at the other, or two, three, or four boxes at each end; the latter are called *pick-and-pick* looms, as the shuttle may be sent across for a single pick of one color and changed at the opposite end for one with a new color, while with a loom having one box at one end it is readily seen that only multiples of two threads of filling can be used no matter how many boxes are at the opposite end, the shuttle being obliged to cross and return before the color can be changed by the drop box.

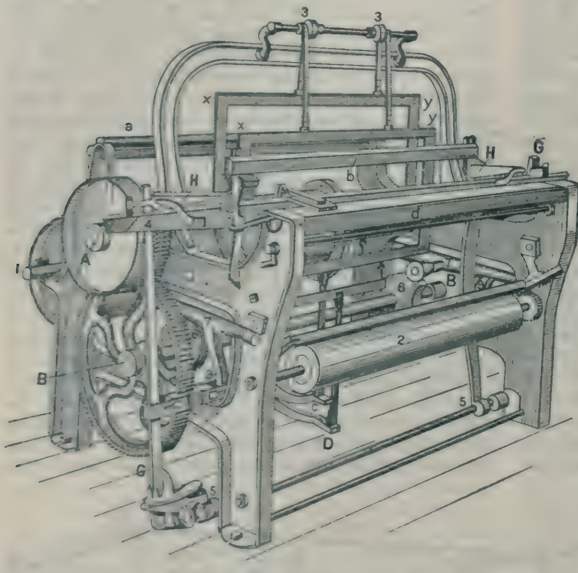


Fig. 2. POWER LOOM.

The first successful *power loom* was invented in 1785 by Edmund Cartwright (q.v.). Several unsuccessful attempts had previously been made to produce a practical power loom; early in the seventeenth century there is reported to have been set up in the city of Danzig "a rare invention for weaving four or five webs at a time without any human help." This mechanism and its author met the fate of many later inventors, for it is further recorded that "the invention was supprest because it would prejudice the poor people of the town and the artist was made away secretly." In 1778 another power loom was constructed by a Frenchman named De Gennes, which possessed many of the features of the modern loom; but it never came into practical use. In 1762 a power loom was set up in a weaving mill in Manchester, but it proved a failure.

Cartwright's first loom was crude, especially as the inventor was unacquainted with practical mechanics or with the art of weaving; but he continued his efforts until he produced a satisfactory machine. In this pursuit he spent all his time and money, and, as it did not come into general use until his patents had expired, he received no financial return for his labors. In 1808, however, Parliament voted him £10,000. It was said that he spent fully four times that sum in perfecting his loom.

During the century after Cartwright's invention the development of the loom received the attention of hundreds of inventors, and at the beginning of the twentieth century we find a vast number of different types in operation, all embodying, however, the fundamental principles of the original.

The simplest type of modern power loom is shown in Fig. 2. The *loom frame* supports two horizontal shafts, *A*, *B*, one above and a little back of the other and so geared together that the upper shaft, to which the power is applied, makes two revolutions to one of the lower. The upper shaft is supplied with two cranks, one at each end, near the frame, to which the *lathe*, 4, is attached with short connecting rods, and as the shaft revolves it imparts to the lathe a reciprocating motion as the latter swings on the pivot, 5, 5, at the bottom of the loom frame. The lower shaft is supplied with certain attachments called cams, near the centre, which work in contact with the *loom treadles*, *C*, *D;* the latter are connected to the harness frames, *xy*, *xy*, suspended from a roller, 3, 3, above, and as the shaft revolves first one is depressed and then the other, forming sheds with the warp as in the hand loom. The lower shaft is also supplied with certain appliances, 6, 6, which act on two special *rocker shafts*, 7, 7, one at each end of the loom, placed at right angles to and in a horizontal plane above the lower shaft and each having an arm, 9, to which is connected a *picker stick*, *G*, *G;* these picker sticks are so arranged that when the lower shaft revolves the action on the short rocker shafts causes the picker stick on one side to be jerked quickly towards the warp which is being woven and to throw the shuttle from that side of the loom through the shed into the *shuttle box*, *H*, *H*, at the opposite end, where it remains until the filling is beaten up by the action of the lathe, and the harnesses change position, forming a new shed, when the second picker stick is acted on as was the first and the shuttle is driven back to its former position and the operation is repeated continuously.

In this loom the warp is not stretched directly from the *warp beam*, 1, to the *cloth roll*, 2, as in the hand loom, but is carried upward at an angle from the warp beam over a support called the *whip roll*, *a*, from which it is stretched, through the harness and reed—which are held firmly in the lathe by the *handrail*, *b*—to the *breast beam*, *d*, over which the cloth passes downward to the cloth roll; it will be seen that by this arrangement the loom is made to take up much less space than it would in any other form. The modern power loom also combines a number of appliances which were made necessary by the application of power and which make it possible for the weaver to keep a number of looms running, while the hand weaver could run but one. Of these special attachments may be mentioned the *filling stop motion,* which automatically causes the loom to stop should the filling become exhausted in the shuttle or break; the *shuttle protector,* which is so arranged that should the shuttle for any reason fail to reach its place in the shuttle box to which it has been driven, the loom is stopped and held so that the lathe will not cause any of the warp threads to be broken should the shuttle happen to be caught in the shed and the loom not stop; the automatic *take-up* and *let-off motions,* which let the warp unroll from the warp beam at the required speed and wind up the woven cloth automatically, regulating the number of filling threads to the inch. There has also recently been perfected the *warp stop motion,* which is arranged to act on the driving motion of the loom and to cause the loom to stop immediately should one of the threads of the warp become broken.

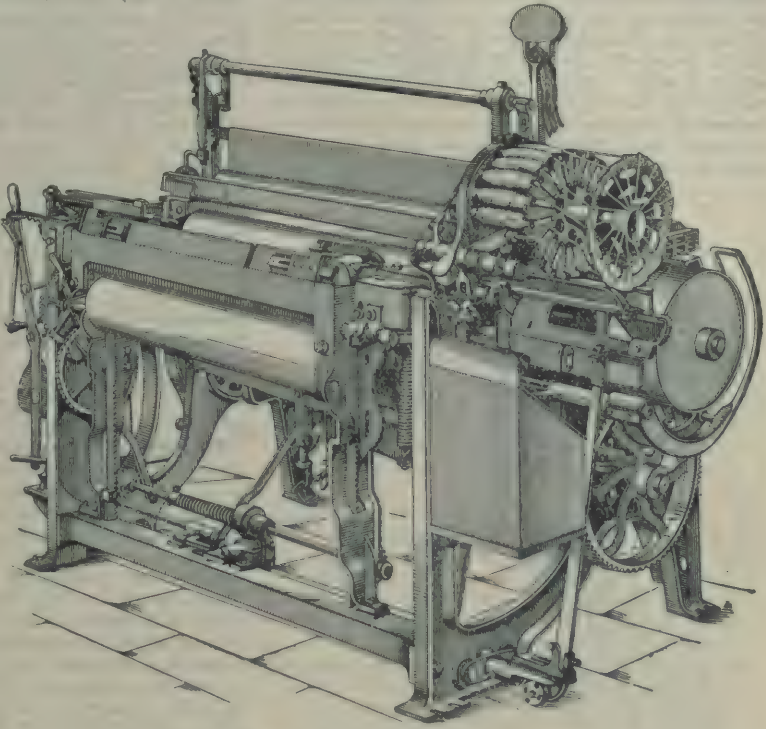


Fig. 3. NORTHROP LOOM.

In the *Northrop loom,* Fig. 3, the loom shuttle and one of the shuttle boxes are made without any bottom, and above this shuttle box is arranged a magazine or hopper, kept supplied with a large number of full bobbins; as the filling in the shuttle runs out, the mechanism of the loom so acts on one of the fresh bobbins of yarn that it is forced downward into the shuttle and in turn forces the empty bobbin out through the holes in the bottom of the shuttle and the shuttle box, and the loom continues to run as if no change had been made.

Looms for fabrics which require not more than five harnesses to produce the weave are generally called *cam looms,* for the reason that the harness is operated by the action of cams on the loom treadles. For fabrics which require more than five harnesses special *fancy looms* are arranged; these usually have a *head motion*—a mechanism which regulates the pattern to be woven and may control the movement of as many as 30 harnesses; *dobbies* and *witches* are special head motions.

The Jacquard attachment, Fig. 4, invented by Joseph Marie Jacquard (q.v.), may be applied to almost any style of loom and is simply a head motion to control the loom harness and to form the shed. It consists of a set of perpendicular *hooks, AB, AB,* connected with and controlled by a set of horizontal *needles, C, C;* above these hooks—which are placed in 4, 6, 8, or 12 rows to the machine, which may have from 200 to 1200 or more hooks—is a set of knives, 1, 1, called a *griffe,* with one knife for each row of hooks. To the lower extremity of each hook is attached a loop of twine called the *neck cord, d,* which is passed through the *bottom board,* 2, 2, having perforations immediately under each hook; from the neck cords hang the *leash strings, E, E,* and there may be from one to half a dozen of these to each hook. These leash strings are passed through a board placed horizontally a little above the warp to be woven, called the *comber board,* 3, 3, having rows of perforated holes to correspond with the number of warp threads. This board is divided into sections, and in what is called a straight tie-up of the harness there are as many leash strings to each hook as there are sections; in the illustration given there are four sections.

Below the comber board and at the place where the shed is to be formed each leash string is supplied with an eye called a *mail, F, F′,* through which the warp thread to be controlled is passed; and to the lower end of each leash string is attached the *lingo, g, g′,* a small weight to draw it down. The neck cord, leash strings, mail, and lingoes make up the Jacquard harness. The needles are held in place by a *needle board,* 4, which is made with rows of holes through which the ends of the needles pass about three-eighths of an inch, pointing to the front, and a *spring box,* 5, 5, at the back having a series of spiral springs, one for each needle, which, pressing the needle to the front, keep the hooks in a vertical position. The pattern to be woven is regulated by an endless chain of heavy pasteboard cards, *L, L, L,* which pass over a square prism, called the *cylinder*, *OPQR*, which is caused to revolve intermittently by swinging in and out like a pendulum in an arc, the cord of which is a little longer than the cylinder is square; as the cylinder swings out the *catch*, *x*, engages one of the pins, *O′*, *P′*, *Q′*, *R′*, causing the cylinder to make a quarter revolution, bringing a new card into position. The cylinder is perforated with rows of holes to correspond with the needles of the machine, and when the bare cylinder is allowed to come in contact with the needle board the needles projecting through the latter readily enter the perforations without moving the hooks; but the pattern cards are so perforated that for all warp threads that are to be raised above the filling in the woven pattern holes are cut for the needles which control them to pass through, the holes being cut to superimpose the holes in the cylinder; but holes are not cut in the cards for the needles controlling those warp threads which are not to be raised. After the chain of cards is placed on the card cylinder and the pattern card, which just covers one face of the cylinder, is brought in contact with the needles projecting through the needle board, those needles which are opposite the holes cut in the card pass through and enter the perforations in the cylinder as if no card were there, while wherever there was no hole cut the needle is forced back, and with it the top of the hook which it governs, to a position so that the griffe, 1, 1, as it is raised, 1′, 1′, passes the hooks and the knives only engage and lift the hooks which have not been pushed back by the card; and every hook in the machine which has not been pressed back is raised by the griffe and with it the harness attached to it and the warp threads which it controls. Thus it is obvious that any desired interlacing of the threads in the fabric can be obtained by the way in which the pattern cards are perforated, each separate card regulating the warp threads for the entrance of one thread of filling, and there being as many cards necessary as there are filling threads in one repeat of the pattern; some very elaborate designs have required the use of 20,000 to 30,000 cards for a single design.

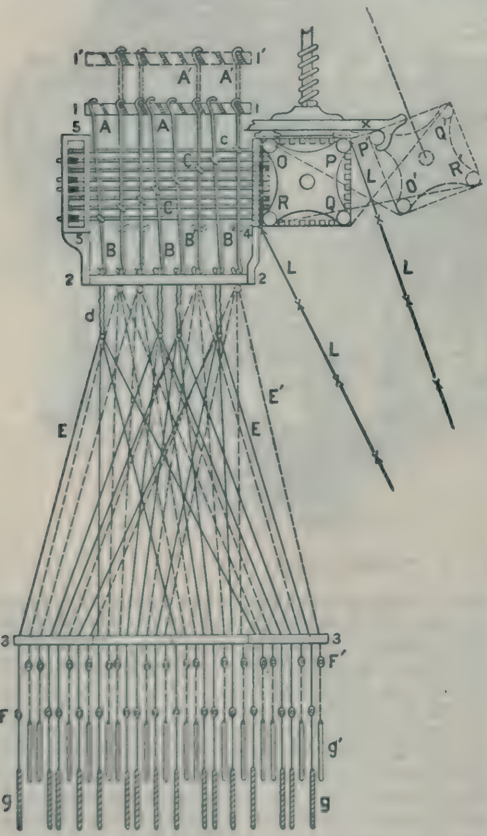


Fig. 4. JACQUARD ATTACHMENT.

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LOO′MIS, Alfred Lebbeus (1831–95). An American physician. Born at Bennington, Vt., he graduated from Union College in 1851. He studied medicine at the College of Physicians and Surgeons, New York, and graduated in 1852. At this time the science of auscultation and percussion was developing very rapidly; and this circumstance led him to adopt diseases of the lungs and heart as his specialty. He was appointed visiting physician to Bellevue Hospital in 1859, and became lecturer on physical diagnosis at the College of Physicians and Surgeons in 1862. Shortly after this his health broke down completely, and he spent six months in the Adirondacks. The benefit derived from his residence there led to the establishment, years later, of the sanatorium at Saranac, and also, at Liberty, Sullivan Co., N. Y., of a Hospital for Consumptives. In 1866 he became professor of the theory and practice of medicine at the University of the City of New York, the medical department of which later became University and Bellevue Hospital Medical College. Professor Loomis was appointed visiting physician to Mount Sinai Hospital in 1874; was president of the New York Academy of Medicine in 1889–90 and again in 1891–92; and in 1893 served as president of the Association of American Physicians. He published *Lessons in Physical Diagnosis* (1868; 11th ed., revised and enlarged, 1899); *Lectures on Fevers* (1877); *A Text-Book of Practical Medicine* (1884). He was, in addition, editor of *An American System of Medicine* (1894).

LOOMIS, Charles Battell (1861–1911). An American author, born in Brooklyn, N. Y., and educated at the Polytechnic Institute there. He was in business from 1879 to 1891, but gave it up to devote himself to the writing of magazine sketches and books much appreciated for their humor. Among the latter are: *Just Rhymes* (1899), verse; *The Four-Masted Cat-Boat* (1899); *Yankee Enchantments* (1900); *A Partnership in Magic* (1903); *Cheerful Americans* (1903); *More Cheerful Americans* (1904); *I've Been Thinking* (1905); *Minerva's Manœuvres*

(1905); *Cheer Up* (1906); *A Bath in an English Tub* (1907); *Poe's "Raven" in an Elevator* (1907), the third edition of *More Cheerful Americans; The Knack of It* (1908); *A Holiday Touch* (1908); *Just Irish* (1909).

LOOMIS, Eben Jenks (1828–1912). An American astronomer, born at Oppenheim, N. Y. He attended the Lawrence Scientific School (Harvard) in 1851–53; was assistant in the *American Ephemeris and Nautical Almanac* office from 1850 to 1900, when he retired; and was a member of the United States eclipse expedition to Africa in 1889. He is author of *Wayside Sketches* (1894); *An Eclipse Party in Africa* (1896); *A Sunset Idyl, and Other Poems* (1903).

LOOMIS, Elias (1811–89). An American mathematician, born in Willington, Conn. He graduated at Yale College in 1830; was tutor there for three years, 1833–36; spent the next year in scientific investigation in Paris; on his return was appointed professor of mathematics in the Western Reserve College, Ohio; from 1844 to 1860 held the professorship of natural philosophy and mathematics in the University of the City of New York (now New York University), and in the latter year became professor of natural philosophy in Yale. Professor Loomis published (besides many papers in the *American Journal of Science* and in the *Transactions of the American Philosophical Society*) many textbooks on mathematics.

LOOMIS, Francis Butler (1861–). An American journalist and diplomat, born at Marietta, Ohio, and a graduate (1883) of Marietta College. He had considerable early newspaper experience—in New York with the *Tribune*, in Washington as correspondent, and in Cincinnati as editor of the *Daily Tribune* (1893–96). Previous to 1893 he spent three years at Saint-Etienne, France, in the consular service, and subsequently (1897–1901) served as Minister to Venezuela, where he conducted the difficult negotiations regarding commercial privileges and concessions. Charges that Loomis, while in Venezuela, and actively interested in the movement to build up commerce between the United States and South America, had carried on improper business transactions, were made (1905) by H. W. Bowen, Loomis's successor, but were dismissed by President Roosevelt. He was Minister to Portugal in 1901–02. As Assistant Secretary of State (1902–05), he was for a short time in charge of the department ad interim; and was designated as special Ambassador to France to receive the remains of John Paul Jones (1905), and as government representative at various foreign expositions. He received decorations from France and Japan.

LOOMIS, Gustavus (1789–1872). An American soldier, born at Thetford, Vt. He graduated at West Point in 1811, entered the army as second lieutenant of artillerists, and, after doing garrison duty in the harbor of New York in 1812–13, was ordered in the latter year to the Niagara frontier. He assisted in the capture of Fort George (May 27, 1813) and was made prisoner at Fort Niagara on December 19 following. In 1832–33, during the Black Hawk War, he was in garrison at Fort Crawford, Wis., in 1837 and 1856–58 served against the Seminole Indians, and in 1857–58 commanded the Department of Florida. During the Civil War he was superintendent of the general recruiting service, and in 1863 was retired from active service with rank of colonel of infantry. In 1865 he was brevetted brigadier general for long and faithful service in the army.

LOOMIS, Silas Laurence (1822–96). An American scientist and educator. He was born in Coventry, Conn.; graduated from Wesleyan in 1844 and, in medicine, from Georgetown University in 1856. Previous to his study at Wesleyan he had taught at Holliston Academy, Massachusetts; after graduation he was principal of Western Academy, Washington, D. C., and subsequently he became professor of physiology (1859–60) at Georgetown. He was astronomer to the United States Coast Survey in 1857, and instructor in mathematics to naval cadets in 1860. From 1861 to 1867 he was professor of chemistry and toxicology at Georgetown, then became professor and later was dean (until 1872) in Howard University. He invented a process for producing a textile fabric from palmetto, a method for utilizing ores of chromium, and various improvements in instruments of precision. His works include *Normal Arithmetic* (1859); *Analytical Arithmetic* (1860); *Key to the Normal Course* (1867); *The Education and Health of Woman* (1882).

LOON, lō-ōn′. The largest town of the island of Bohol, Philippines. It is in a picturesque spot on the extreme west coast, about 13 miles north of Tagbilaran. Between the town and Sandigan Island, three miles to the north, is a well-sheltered anchoring ground. The town proper is reached by a mole 328 feet long, and steps cut in the side of the hill on which it lies. It is guarded by an old Spanish fort. Pop., 1903, 18,114.

LOON (archaic *loom*, from Icel. *lōmr*, loom; confused with *loon*, ODutch *loem*, stupid fellow). In North America, a water bird of the family Gaviadæ, especially the great northern diver (*Gavia immer*). In Great Britain the word is often pronounced *loom* and is locally applied to the grebes. Arctic seamen, moreover, give this name to the murre (*Uria lomvia*), whose crowded nesting colonies on the cliffs they term loomeries.

The loon is a bird as large as a goose, with a checkered black-and-white plumage of hard close feathers, rather short wings and tail, and a straight, strong, black beak, preserving the type perfected in the ancient fish-catching diver *Hesperornis* (q.v., for comparative illustrations); the head and neck are iridescent violet and green, with a collar of white streaks; the breast and abdomen pure white. It is a denizen of the subarctic belt of the Northern Hemisphere, where it breeds numerously about all the fresh-water lakes, ponds, and rivers, making a very slight nest on the ground and laying two greenish eggs, unspotted. In America, loons breed as far south as the Great Lakes, but are most numerous about Hudson Bay and in Alaska. In winter they move southward and are to be seen all over the more northerly States. Other species are the red-throated loon (*Gavia stellata*), with a darker back, bluish gray head and neck, and throat marked with a chestnut patch, which is northerly in its breeding haunts, but in winter migrates as far south as Mexico; the yellow-billed loon (*Gavia adamsi*), an arctic resident; the black-throated (*Gavia arctica*), also arctic; and the Pacific loon (*Gavia pacifica*) of the North Pacific coasts. All have similar habits. They rarely come upon land, but swim well out in the open, shy and watchful, and are able to dive with such astonishing quickness and force that they can often dodge the missiles from a gun. Their food consists altogether of fish, which they chase under water with marvelous swiftness by using their wings just as in flight. Having overtaken the fish, they seize it with their sharp-edged beaks, then bring it to the surface, toss it into the air, and catch and swallow it head first. Their voices are prolonged raucous cries, sometimes described as a weird sort of laughter; and these cries, usually associated with lonely waters and hardship, have led to many tales and superstitions among northern peoples. An account of some of them will be found in Watters, *Birds of Ireland* (Dublin, 1853). The loons are of great service to the Eskimo of Alaska, who use their skins extensively for the making of clothing, tool bags, etc. Consult, in addition to standard works and the books of writers on the zoölogy of Alaska (q.v.): Elliott Coues, *Birds of the Northwest* (Washington, 1874); McIlwraith, *Birds of Ontario* (Toronto, 1894); John Macoun, *Catalogue of Canadian Birds* (Ottawa, 1900).

LOOP′ER. See MEASURING WORM.

LOOP′HOLES (from *loop*, OF. *loup*, probably from Dutch *luip*, ambush, from *luipen*, to peep + *hole*). In fortifications or field works, small apertures through which the defenders may fire. Notches and loopholes are alike in all respects except that the latter have a roof or top. The bottom is called the *floor*, or *sole;* the sides, the *cheeks;* the narrowest part, the *throat;* the divergence of the sides outward from the throat, the *splay*. A *hopper loophole* is a pyramidal box of plank with a steel plate spiked across the small end and pierced for fire. See FORTIFICATION.

LOOS, lōs, CHARLES LOUIS (1823–1912). An American educator. He was born in Lower Alsace, France, and came to the United States in 1834. In 1846 he graduated from Bethany College, and he subsequently held pastorates in the Christian Disciples Church at Wellsburg, Va., Somerset, Pa., and Cincinnati, Ohio. He was president of Eureka College at Eureka, Ill., in 1857–58, from 1858 to 1880 was professor of ancient languages in Bethany College, president of Kentucky University from 1880 to 1897, and thereafter professor of Greek in that institution.

LOOSE′STRIFE. See LYSIMACHIA.

LOOSESTRIFE FAMILY. A popular name for a family of plants. See LYTHRACEÆ.

LOOSJES, lōs′yĕs, ADRIAAN PIETERSZOON (1761–1818). A Dutch novelist, born on the island of Texel. He was educated for the Church, but afterward became a bookseller in Haarlem. He wrote several mediocre novels, principally of the historical sort. He also wrote poems, *Minnezangen* (1784), and plays. His novels include: *Frank van Borselen en Jacoba van Beijeren* (1790–91); *Charlotte van Bourbon* (1792); *Louise de Coligny* (1803); *Johan de Witt* (1805); *Historie van Mejuffrouw Susanna Bronkhorst* (1806–07), a novel in the form of letters; *Maurits Lijnslager* (1808); *Johannes Wouter Blommesteyn* (1816).

LOOT. A military term, denoting any property of soldiers or citizens of a hostile country that has been taken without authority and for personal gain. Looting is frequently used as a synonym for pillage, or the plundering of an enemy by open force. Formerly the privilege of looting an enemy's city or encampment was the right of the soldiery and was frequently offered as an inducement to obtain reënforcements or recruits. Looting is prohibited by the laws of war agreed to by all civilized nations, and special regulations now govern the disposition of all property seized by soldiers. See BOOTY; INTERNATIONAL LAW.

LOP-EARED RABBIT. See Plate of HARES AND PIKA.

LOPE DE AGUIRRE, lō′pâ dâ ȧ-gē′rȧ. A Spanish adventurer and explorer in South America. See AGUIRRE, LOPE DE.

LOPE DE RUEDA, dȧ ro͞o-ā′dȧ. A Spanish dramatist. See RUEDA, LOPE DE.

LOPE DE VEGA, vā′gȧ. See VEGA CARPIO.

LOPES, lō′pâsh, FERNÃO (?1380–?1459). Patriarch of the Portuguese historians. In 1434, at the request of Dom Duarte, who had just ascended the throne, he began to compile his chronicles of the earliest reigns of Portugal. Already, as Crown Prince, Dom Duarte had asked him to write the account of the reign of his father, João I, as we learn from the very title of the work: *Coronica del Rey D. Joham de boa memoria . . . capitulada e composta por F. L. Escrivão da Puridade do Inf. D. Fernando, filho do mesmo Rey . . . a qual Coronica o dito F. L. fez por mandado del Rey D. Duarte sendo Principe* (Lisbon, 1644, and not reprinted). This work, dealing with events down to 1415, contains much matter of a romantic nature and many anecdotic elements incident to the events narrated and the chief figure treated. A certain resemblance between his methods and those of the French writer, and the faculty, shared by both, of making their subjects live, have caused Lopes to be styled the Portuguese Froissart. Other works by Lopes are the *Chronica de D. Fernando* and the *Chronica de D. Pedro* (published in 1816 by the Academia Real das Sciencias in the *Ineditos da historia portugueza*, vol. iv). Consult C. M. de Vasconcellos, "Geschichte der portugiesischen Litteratur," in Gröbers, *Grundriss der romanischen Philologie*, vol. ii (Strassburg, 1897).

LÓPEZ, lō′pâs, CARLOS ANTONIO (c.1801–1862). President and Dictator of Paraguay, born in Asunción. After studying civil and canon law at the ecclesiastical seminary in that city he lived for a number of years in seclusion to avoid the hostility of Dr. Francia, then Dictator of Paraguay. Upon Francia's death, in 1840, he returned to the capital and acted as secretary to the military junta which had become the de facto government of Paraguay. In 1841 he was elected First Consul, and from 1844 till his death held the office of President, being continued in power by the subservient Congress, which finally empowered him to name his successor at will. During his administration, which was virtually a dictatorship, he began the organization of an army and navy, opened Paraguay to foreign commerce, made commercial treaties with foreign powers, built a railroad, and sent many Paraguayans to Europe to be educated. His arbitrariness gave rise to many diplomatic difficulties between Paraguay and foreign states, especially with Brazil, the United States, and England, and he reverted to the policy of excluding foreigners. His administration was in general, however, a period of internal tranquillity and material prosperity.

LÓPEZ, FRANCISCO SOLANO (1827–70). President and Dictator of Paraguay, born at Asunción, the son of Carlos Antonio López. He was educated in Paris, and at the age of 18 he was appointed by his father commander in chief of the Paraguayan army. In 1854 he was sent to Europe on a diplomatic mission and negotiated treaties with England, France, and Sardinia. On his return to Paraguay he assumed the office of Minister of War. Upon the death of his father, in 1862, he succeeded to the presidency and continued the dictatorial powers. Fired with the ambition of becoming the Napoleon of South America and of establishing a powerful Empire, he increased the army to about 65,000 men and prepared secretly to seize portions of Brazil and the Argentine Republic. When Brazil intervened in the civil struggle in Uruguay in 1864, López demanded that the former country should withdraw her troops at once. Upon the refusal of Brazil to accede to the demand he took possession of the Province of Matto Grosso. Congress met at Asunción and conferred extraordinary powers upon him and made him Marshal of the army. In 1865 he demanded permission of the Argentine Republic to march troops through her territory, in order to invade the Brazilian Province of Rio Grande do Sul. This being refused, he promptly declared war and occupied the Argentinian Province of Corrientes with 22,000 troops. Successful in his first operations, López was soon compelled to fight the combined forces of Brazil, Uruguay, and the Argentine Republic, who entered into an alliance against him and invaded Paraguay in 1866. The war lasted four years, López recruiting his forces by a conscription of all persons between the ages of 12 and 70 and offering a desperate resistance to the enemy. The campaign of 1867 went against him, and in 1868 Humaitá (q.v.), the fortified city guarding the Paraguay River, was captured by the allies. Maddened by his reverses, López arrested and put to torture many of the civil officers of the government and the foreign diplomatic corps on a charge of conspiracy. A number were executed, among them his own brother and sister, and the lives of some of the members of the American mission were saved only by the timely arrival of an American squadron. Finally, on March 1, 1870, López, who had gradually been driven into the north of Paraguay, was overtaken by the Brazilian cavalry at the Aquidaban River and killed. From Europe López had brought with him a certain Mrs. Lynch as his mistress. She was a woman of great force of character and influenced his career decidedly. See Paraguay, *History*.

LÓPEZ, Narciso (1798–1851). A Spanish-American soldier and filibuster, born in Venezuela. Entering the Spanish army, he fought in the campaigns of Morales against the Venezuelan patriots. After the war he went to Spain, where he distinguished himself in the Carlist wars. In 1839 he was made field marshal and appointed Governor of Valencia. Two years later he went to Cuba with Captain General Valdés, and there served in various administrative positions. He was removed from office by General O'Donnell in 1843. Having failed in various business enterprises, he entered into a conspiracy against Spain and was forced to flee to the United States in 1848. Here in conjunction with the Cuban Junta of New York and with the aid of Governor Quitman of Mississippi and other Southerners, he planned three expeditions to seize Cuba. The first expedition (1849) failed because of the interference of the United States authorities. The second (1850) landed in Cuba, but was soon driven out. The third (1851) and most important was fitted out at New Orleans. López offered the chief command to Jefferson Davis, then a United States Senator, who, however, declined and suggested Robert E. Lee, who likewise declined. López then decided to command the expedition himself, and on Aug. 3, 1851, sailed with 450 or 480 followers on the steamer *Pampero*. The filibusters succeeded in landing on the coast of Cuba about 60 miles from Havana, but were soon attacked by an overwhelming force and killed, captured, or dispersed. A great many of the captives were executed, while others were imprisoned. López himself was taken, and was garroted at Havana, Sept. 1, 1851. Consult: D. T., *El General Narciso López y la Isla de Cuba* (Carácas, 1851); J. F. Claiborne, *Life and Correspondence of John A. Quitman* (New York, 1860); V. Morales, *Iniciadores y primeros mártires de la revolución cubana* (Havana, 1901).

LÓPEZ DE AYALA, lō′pȧth dā ȧ-yä′lȧ, Adelardo (1828–79). A Spanish dramatist, poet, and politician, born in Guadalcanal, Province of Seville, May 1, 1828, or perhaps in March, 1829 (authorities differ). He studied law at the University of Seville and then went to Madrid. There, before he was 21 years of age, he produced his first drama, *El hombre de estado*, which won praise from the critics, and was performed in 1851. In 1857 he was elected a deputy to the Cortes from Badajoz. Acquiescing in the revolution of 1868, he accommodated himself also to later changes in the administration and was a member of the first cabinet under Alfonso XII. He died rather suddenly at Madrid, December 30, 1879, being then president of the Congress. Ayala figures in the post-Romantic period in Spain, and his work is marked by good taste and temperance of expression. His few lyrics are of high poetic merit, especially his sonnets. One of these, the *Dame, Señor, la firme voluntad*, was set to music by his intimate friend the composer Emilio Arrieta, and is sung every year at the services in commemoration of his death. The best of the lyrics is the *Epístola* in octaves, addressed to Arrieta. As a dramatist, Ayala represents a psychological tendency in Spanish letters. This tendency is clear in Ayala's very first play, the *Hombre de estado*, dealing with the tragic story of a personage of the seventeenth century, the statesman and lover Don Rodrigo Calderón. In 1854 appeared the *Rioja*, a piece superior in many ways to the *Hombre de estado*. The moral purpose is manifest in the *Tejado de vidrio*, a drama of much merit. A still greater development in art is seen in the *Tanto por ciento* (So Much per Cent), a piece merciless in its sociological analysis. Not long after the appearance of this play he was presented with a gold crown paid for by public subscription. Ayala's dramatic fame reached its height with the *Consuelo* (1878). Consult the edition of his *Obras* (plays, dramas, and poems), in the *Colección de escritores castellanos*, lyrics in vol. vii (7 vols., Madrid, 1881–1885); J. O. Picón, in *Autores dramáticos contemporáneos y joyas del teatro español del siglo XIX* (2 vols., ib., 1881–82); Blanco-García, *La literatura española en el siglo XIX, parte segunda* (2d ed., ib., 1903); A. Bonilla y San Martín, in *Revue Hispanique*, vol. xii (New York, 1905), critical edition of the *Epístola;* A. Pérez Calamarte, in *Revue Hispanique*, vol. xix (ib., 1908), critical edition of the unpublished novel *Gustavo.*

LÓPEZ DE AYALA, Pedro (1332–1407). A Spanish author, born in 1332. He was of noble origin and must not be confused with his grandfather and his great-grandfather, both distinguished noblemen, statesmen, and warriors, who bore exactly the same name. This Pedro held office under Peter the Cruel, Henry II, John I, and Henry III, becoming Grand Chancellor of the Realm in 1398. He was twice made captive by enemies of his country, once by the Black Prince, at Nájera (1367), and again at Aljubarrota (1385), and during this second captivity he spent 15 months in an iron cage at Oviedes. Although he was incessantly active in political life, Ayala none the less seems to have found leisure to carry on literary pursuits. In Spanish literature of the fourteenth century he assumes a distinguished place by reason of his historical labors, his translations, and his verse. As a translator, he rendered into Castilian Guido delle Colonne's *Historia Troiana*, parts of Livy's work, and Boccaccio's *De Casibus Virorum Illustrium.* His knowledge of Livy's methods stood him in good stead in his *Crónicas de los reyes de Castilla*, a work showing a tendency to avoid legendary accounts, to sift evidence carefully, and to record personal experience. The first part (Peter the Cruel) was printed at Seville, 1495; and the first complete edition appeared in the *Crónicas Españolas*, 1779–80, under the auspices of the Royal Academy of History. In his long poem, the *Rimado de Palacio*—a name given to it by others—he incorporates matter of personal experience. The poem is satirical and didactic. Its earlier part is in the *cuaderna vía*, the quatrain stanza that was so great a favorite in the thirteenth-century didactic and narrative poems; in the second part, the *cuaderna vía* structure is broken by the songs, prayers, and laments in various lyric measures, which are scattered here and there throughout. Much interest attaches to the *Rimado de Palacio* because of the pictures which it gives of the customs of the age. In his lyrics Ayala adopted the Provençal manner. Consult the edition of the *Rimado* in vol. lvii of the *Biblioteca de autores españoles* (Madrid, 1864); that of his *Crónicas* in Llaguno Amírola's *Crónicas españolas* (ib., 1879) and in Rosell's *Crónicas de los reyes de Castilla* (ib., 1875–78); Rafael de Floranes, *Vida literaria de Pedro López de Ayala*, in the *Colección de documentos inéditos para la historia de España*, vols. xix and xx (ib., 1851–52); F. Wolf, *Studien, etc.* (Berlin, 1859); Marcelino Menéndez y Pelayo, *Antología de poetas líricos castellanos*, vol. iv (Madrid, 1890); F. W. Schirrmacher, "Ueber die Glaubwürdigkeit der Chronik Ayalas," in *Geschichte von Spanien*, vol. v (Berlin, 1902).

LÓPEZ DE LEGAZPI, lâ-gäth′pê, or **LEGASPI**, lâ-gäs′pê, Miguel (c.1510–72). A Spanish soldier, navigator, and conqueror of the Philippine Islands. He was born at Zumárraga (Guipúzcoa) and went to Mexico in 1545. Having distinguished himself as chief secretary of the city and government of Mexico, he was put in charge of the expedition sent out by the Viceroy, Velasco, in 1564, to conquer the Philippines. With a convoy of four ships Legazpi arrived there in 1565 (having in January taken possession of the Ladrone Islands and changed their name to the Marianas), and sent out parties to explore and occupy the country. The first settlement was made at San Miguel on the island of Cebu (May, 1565), and after completing the conquest of Luzon he founded the city of Manila (May, 1571). The islands were annexed with little bloodshed, thanks in a great measure to the humane nature of Legazpi himself. They received from him the name of Islas Filipinas, in honor of Philip II.

LÓPEZ DE MENDOZA, Iñigo, Marqués de Santillana. See Santillana, Iñigo López de Mendoza, Marqués de.

LÓPEZ DE RECALDE, dâ râ-käl′dâ, Iñigo. The original name of Ignatius of Loyola (q.v.).

LÓPEZ DOMÍNGUEZ, dô-mēn′gâth, José (1829–1911). A Spanish general and statesman, born at Marbella, Malaga. He graduated from the Artillery School at Segovia in 1850 and four years later aided Leopold O'Donnell (q.v.) in his military uprising. During the Crimean War he was attached to the headquarters of the French army and during the Italian War to the headquarters of Napoleon III, and he served with distinction in the Moroccan War. In the intervals between these wars he was a member of the Cortes. For signing a protest (1866) against the indefinite adjournment of the Cortes by the Queen (Isabella II), he was imprisoned; soon afterward, implicated in a conspiracy against the government of Gonzáles Brabo, he was exiled to the Canaries. But he returned to fight at Alcolea (1868) in the revolution which drove Isabella from the throne, and he was retained as secretary by the new Regent, his kinsman, Marshal Serrano y Domínguez. When the Republic was established (1873), López was made captain general of Burgos and, being sent by the virtual Dictator, Castelar (see Castelar y Ripoll), against Cartagena, held by the Federals, he took it by assault; for this he was promoted lieutenant general. As commander in chief in Cataluña, he later helped put down a Carlist uprising, and upon the restoration of the monarchy he held for a short time a seat in the superior Council of War. In 1883 he was one of the creators of the Dynastic Left, a party pledged to uphold the guaranties of the constitution of 1869; in 1893 he was Minister of War in Sagasta's cabinet; and in 1905 he was President of the Senate. He became Premier and Minister of War in 1906, but his violent anti-Church policy split the Liberal party, and he resigned in November of the same year. Thereafter until his death he remained the titular head of the Democratic party, although Canalejas came to be its active guiding influence. His brilliant career won recognition from all the governments that he served during those troublous years, as witness his decorations: the medal of Africa, the cross of the Order of Christ of Portugal, and of San Fernando, and the grand cross in the following orders: Crown of Italy, Charles III, Military Merit, Naval Merit, and San Hermenegildo. He published a book entitled *Memorias y comentarios sobre el sitio de Cartagena* (Madrid, 1878).

LOPH′IODON (Neo-Lat., from Gk. *λόφιον*, *lophion*, *λοφεῖον*, *lopheion*, dim. of *λόφος*, *lophos*, crest + *ὀδούς*, *odous*, tooth). A fossil ungulate mammal of the size of a rhinoceros, found in the Lower and Middle Eocene deposits of Europe. It is one of the early and generalized types of perissodactyls of odd-toed ungulates and has some points of resemblance to the tapirs, to the ancestral stock of which it seems to have been indirectly related.

LOPHOBRANCHII, lŏf′ô-brăn̤′kĭ-ī (Neo-Lat. nom. pl., from Gk. *λόφος*, *lophos*, crest + *βράγχια*, *branchia*, gills). An order of osseous fishes, having the ultimate divisions of the gills not pectinated, but arranged in small tufts in pairs along the branchial arches. There is nothing like this in any other fishes, and the order is regarded by Jordan as representing "the extreme of degradation of the line of descent composed of the Hemibranchii and Lophobranchii." The fishes of this order are few, mostly of small size, angular form, and peculiar aspect. The gill cover is large, and the gill opening is a small hole. The snout is elongated and tubular. The order includes the sea horses, pipefishes, etc., forming the suborder Syngnathi and family Syngnathidæ.

LOQUAT, lō′kwăt (from Canton Chin. *lukwat*, from *luk*, a rush, *kiuh*, orange), *Eriobotrya japonica.* A Chinese and Japanese fruit, of the family Rosaceæ, introduced in subtropical climates and becoming popular in California and Florida. The tree or shrub which produces it is an evergreen, which attains a height of 20 or 30 feet, but in cultivation is seldom allowed to exceed 12 feet. It has large oblong wrinkled leaves, fragrant white flowers in terminal woolly panicles, downy oval or pear-shaped yellow fruit about an inch in diameter and of an agreeable acid flavor. The large seeds also have an agreeable flavor, which they impart to tarts. During recent years several improved varieties have been produced in California. The loquat is also valuable as a decorative plant. In cool climates it is frequently grown as a pot plant.

LORAIN, lô-rān′. A city in Lorain Co., Ohio, 25 miles west of Cleveland, on Lake Erie, at the mouth of the Black River, on several steamboat lines, and on the New York, Chicago, and St. Louis, the Baltimore and Ohio, the Lorain and West Virginia, and the Lake Shore Electric railroads (Map: Ohio, F 3). It is in a natural-gas region, is the outlet for the central Ohio coal fields, and ships from a fine harbor large quantities of coal, lumber, iron ore, and grain. There are more than 6 miles of dock frontage. Lorain has also several important industrial interests, including steel works, foundries, automatic shovel works, a large shipbuilding plant, stove works, etc. The city contains a Carnegie library and the St. Joseph's Hospital. Lorain was not permanently settled until the early part of the nineteenth century, although a Moravian mission had been established here many years before. The place was incorporated as the village of Charleston in 1836, the name changed in 1874, and it was chartered as a city of the second class in 1896. The government, under the Law of 1902, is vested in a mayor elected every two years, a unicameral council, and administrative boards as follows: board of public safety, appointed by the mayor; board of public service, including the board of health, elected by popular vote. The city owns and operates the water works. Pop., 1890, 4863; 1900, 16,028; 1910, 28,883; 1914, 34,360; 1920, 37,295.

LORCA, lôr′kȧ (Lat. *Eliocroca*). A city in the Province of Murcia, Spain, 38 miles west of Cartagena, on the right bank of the Sangonera, picturesquely situated on an eminence crowned by a fortified castle commanding a magnificent view (Map: Spain, E 4). It consists of an old Moorish town with narrow streets and half-ruined palaces on the hill slope and a modern section in the plain. It is a flourishing town, with flour and textile mills, saltpetre and powder works, and mines of sulphur, lead, and silver. In order to retain the surplus waters of the Sangonera for agricultural use in the dry season, an immense reservoir, one of the largest in Europe and called the Pantano de Puentes, had been constructed by means of a dam 800 feet long and 160 feet high. This dam was broken through in 1802, causing a terrible inundation of the valley, attended with great loss of life. It was successfully rebuilt in 1886. Pop., 1900, 69,910; 1910, 70,807.

LOR′CHA (perhaps a corruption of Portug. *lancha*, pinnace). A small sailing vessel common in the Philippines and surrounding islands. It is built like a European or American vessel and was formerly rigged somewhat like a Chinese junk (q.v.), but many are now rigged like two-masted schooners.

LORD (AS. *hlāford*, from *hlāf*, *loaf* + *weard*, keeper). A title given in Great Britain to persons noble by birth or by creation. Peers of the realm are so styled; the lay peers are known as lords temporal, the archbishops or bishops who are members of the House of Lords as lords spiritual. By courtesy the title "lord" is given to the eldest sons of dukes, marquises, and earls, and to the younger sons of dukes and marquises. Certain officials, e.g., of the Treasury and Admiralty, while collectively called lords in virtue of their office, are not so addressed personally. Consult Selden, *Titles of Honour* (3d ed., London, 1672), and Burke, *Peerage* (ib., annual). See Baron; Duke; Earl; Marquis; Viscount; Peer; Forms of Address; Dignity; Title.

LORD. In the English system of landholding, the feudal superior of whom land is held. Thus employed, the term is the exact equivalent of "landlord" and conveys no implication of social superiority or of class distinction. In the feudal sense the word signifies one of whom lands are held in fee, and in that sense the King of England is still lord paramount of all the lands in the Kingdom, and there are still many lords of manors, called mesne lords because standing between the lord paramount and the freehold tenant actually seised of the land. The term is seldom used in the United States except to describe the lessor of land in the modern relation of landlord and tenant (q.v.). See Fee; Estate; Feudalism; Freehold; Manor; Tenure.

LORD, Chester Sanders (1850–). An American newspaper editor. Born at Romulus, N. Y., he studied at Hamilton College in 1869–70. He was associate editor of the Oswego (N. Y.) *Advertiser* in 1871–72, and then joined the staff of the New York *Sun.* Of this paper he was managing editor from 1880 to 1913. He served as regent of the University of the State of New York from 1897 to 1904 and after 1909.

LORD, John (1812–94). An American historian and lecturer, born at Portsmouth, N. H. He graduated at Dartmouth in 1833 and then entered the Andover Theological Seminary, where in his second year he wrote a series of lectures on the Dark Ages, which he delivered the next fall during a tour through northern New York. After graduating at Andover he became an agent for the American Peace Society. Later he was called to a church at New Marlboro, Mass., and then to one at Stockbridge, Mass. But in 1840 he gave up his pastoral duties to become a public lecturer. He published: *The Old Roman World* (1867); *Ancient States and Empires* (1869); *Points of History* (1881); *Beacon Lights of History* (1883–96), which contains in final form much of the material used in his previous works and in his lectures. Dr. Lord was a popular and entertaining historian and made no pretense to originality or to minute accuracy.

LORD, JOHN KING (1848–). An American Latin scholar, born in Cincinnati, Ohio. He was educated at Dartmouth College (A.B., 1868; Ph.D., 1893), to which, after teaching one year at Appleton Academy, New Ipswich, N. H., he returned to be tutor in Latin (1869–72), associate professor of Latin and rhetoric (1872–80), Evans professor of oratory and belles-lettres (1880–82), associate professor of Latin language and literature (1882–92), Daniel Webster professor after 1892, acting president (1892–93), and acting president of the faculty (1893–1909). He published editions of Cicero, Lælius, and Livy, a translation of Hertzberg's *Geschichte der Römer im Alterthum* (1902), an *Atlas of the Geography and History of the Ancient World* (1902); and he edited a *History of Dartmouth College* (vol. i, 1891; vol. ii, 1913).

LORD ADVOCATE OF SCOTLAND. See ADVOCATE, LORD.

LORD CHAMBERLAIN. See CHAMBERLAIN, LORD.

LORD CHANCELLOR OF ENGLAND. See CHANCELLOR; CHANCERY, COURT OF.

LORD CHIEF JUSTICE OF ENGLAND. The official title of the Chief Justice of the King's Bench Division of the Supreme Court of Judicature in England. While the three superior courts of common law (the King's Bench, Common Pleas, and Exchequer) were substantially equal in power and jurisdiction, the Court of King's (or Queen's) Bench has always enjoyed a certain preëminence and, as a result, the Chief Justice of that court has had precedence over the Chief Justice (sometimes known as the Lord Chief Justice) of the Common Pleas and the Chief Baron of the Exchequer, and this preeminence sometimes led to the assumption by the incumbent of the title of Lord Chief Justice of England. It was one of the charges on which Lord Coke was in 1616 dismissed from office that, as Chief Justice of the King's Bench, he had without rightful authority assumed this more ambitious title. The title grew in favor, however, and gained royal recognition in the appointment by Queen Victoria of Lord Coleridge, Lord Russell of Killowen, and Lord Alverstone as Lords Chief Justices of England, and was finally sanctioned by law in the Judicature Act of 1873 (36 and 37 Vict., c. 66, § 5). By later legislation and orders in council (1880), the Common Pleas and Exchequer Divisions of the Supreme Court are united and consolidated with the King's Bench Division, the offices of Lord Chief Justice of the Common Pleas and Lord Chief Baron of the Exchequer abolished, and the Lord Chief Justice of England established as the supreme judicial officer in the Kingdom next after the Lord Chancellor of England. The Lord Chief Justice is a lord of Parliament by virtue of his office and is entitled to be addressed as "my lord," both in and out of court. See CHIEF JUSTICE; JUDICATURE ACTS; SUPREME COURT.

LORD GREAT CHAMBERLAIN. See CHAMBERLAIN, THE LORD GREAT.

LORD HIGH STEWARD. In England, the title of the highest functionary of state in the feudal period. The office was hereditary in the earls of Leicester, but at an early date declined in importance, its more important duties and authority passing to the justiciar. It was forfeited to the crown upon the disgrace of Simon de Montfort, who held it at that time, but was subsequently regranted to the house of Lancaster, and upon the accession of Henry IV to the throne it became merged in the crown. A Lord High Steward is now only appointed when occasion arises on certain ceremonial occasions, as upon the coronation of a monarch and regularly for the purpose of constituting a court of peers for the trial of a peer for treason or felony. A peer is usually tried in Parliament by the House of Lords, but when the House is not in session it is necessary for the crown to appoint a peer to act as Lord High Steward, whose duty it is to summon the other peers, organize his temporary court, and preside at the trial of the accused peer. The Lord High Steward in such a case is the sole judge of the law and practice, and the other assembled peers are the judges of fact. When Parliament is in session, it is usual, but not necessary, to appoint a Lord High Steward to preside at the trial of such cases, all the peers in that case being judges of both law and facts. The appointment is by royal commission, and the appointee holds office only during the trial of the particular case in which he is summoned to preside. See STEWARD, LORD HIGH.

LORD HIGH TREASURER. See TREASURER, LORD HIGH.

LORD HOWE ISLAND. An island dependency of New South Wales, about lat. 31° 30′ S., long. 159° E., and 360 miles from the east coast of Australia (Map: Australasia, H 6). It has an area of 5 square miles and, like the Admiralty Islets off its northern point, is very fertile. The highest peak on Lord Howe Island is 2840 feet in height. Pop., 1911, 105.

LORD JUSTICE. See JUSTICE, LORD.

LORD JUSTICE CLERK. See JUSTICE CLERK, LORD.

LORD JUSTICE GENERAL. See JUSTICE GENERAL, LORD.

LORD KEEPER OF THE GREAT SEAL. A high officer of state in England, appointed on several occasions, prior to 1760, during an interregnum in the office of Lord Chancellor, to hold the great seal of the Kingdom and administer the functions of the latter. In 1563 the two offices were, by Act of Parliament (5 Eliz., c. 18), declared to be identical in rank, power, and privileges. Consult Foss, *Biographical Dictionary of the Judges of England* (London, 1870). See CHANCELLOR; GREAT SEAL.

LORD LIEUTENANT. The chief crown officer in the counties of Great Britain and Ireland. The office came into existence in the reign of Henry VIII and grew out of the practice of the crown appointing prominent persons in each county in times of disorder or danger to muster the male inhabitants who were capable of bearing arms. This prerogative of the crown was known as issuing "commissions of array." The commissioners took the name of lieutenants of the King and corresponded somewhat to the old English earl as military head of the shire, and as such soon overshadowed the sheriff, who thus lost his control over the county militia and henceforth became a civil officer. The Lord

Lieutenant was responsible to the crown for the efficiency and discipline of the county militia over which he had chief command. The right of the crown to issue such commissions was denied by the Long Parliament, but their legality was established after the Restoration by a declaratory act. The Lord Lieutenant was the permanent local representative of the crown and, on the occasion of an invasion or rebellion, had power to raise the militia, form regiments, troops, and companies, and issue commissions to officers. With the growth of a standing army the county militia became less important, and at the same time the office of Lord Lieutenant dwindled in power. In 1871 his authority over the county militia was withdrawn by Act of Parliament (1871, The Army Regulation Act, 34 and 35 Vict., c. 86, and 1882, The Militia Act, 45 and 46 Vict., c. 49) and transferred to other officers appointed by the Secretary of State for War. By a later act, however (the Territorial and Reserve Forces Act, 1907), the Lord Lieutenant has been restored to his former position of military authority. At the present time he is also the principal justice of the peace in the county, is at the head of the county magistracy, and is responsible for the preservation of order and the administration of justice in the county. He is also keeper of the records (*Custos Rotulorum*), appoints the clerk of the peace, and recommends to the Lord Chancellor the appointment and removal of the justices of the peace for the county. He is usually a prominent landowner, generally serves for life, and is under the control of the Home Office. Consult: C. M. Clode, *Military Forces of the Crown* (2 vols., London, 1869); Henry Hallam, *Constitutional History of England* (2 vols., New York, 1897); Sir W. R. Anson, *Law and Custom of the Constitution* (3d and 4th eds., 3 vols., Oxford, 1907–09).

LORD MAYOR'S COURT. In the city of London an ancient court of record held by custom in the Guildhall, having equitable as well as common-law jurisdiction and having exclusive jurisdiction in causes arising out of the ancient customs of the city. The Lord Mayor and aldermen are the nominal judges, but in practice the court is now held by a judicial officer known as the recorder, whence it is sometimes known as the recorder's court. Its jurisdiction is very extensive as to personal actions, and it transacts a large amount of judicial business. Its judgments are subject to appeal to the King's Bench Division of the High Court or, in some cases, to the Court of Appeal. See COURT; MAYOR; RECORDER.

LORD MAYOR'S DAY. The 9th of November, when the Lord Mayor's show takes place in London. The newly elected Lord Mayor proceeds with much ancient ceremony from the city to the Courts of Justice, where the oath of office is administered. The wooden figures called Gog and Magog, formerly carried at the head of the procession, are now kept in the Guildhall, where the Lord Mayor's banquet is held.

LORD OF MISRULE. See MISRULE, LORD OF.

LORD ORDINARY. See COURT OF SESSION.

LORDS, HOUSE OF. The highest judicial authority in the United Kingdom. The judicial functions now exercised by the House of Lords, as the supreme appellate tribunal of England, Scotland, Ireland, and Wales, are a survival of the extensive judicial powers formerly exercised by the High Court of Parliament. Its claim to original jurisdiction was abandoned in 1670, as the result of a violent dispute between it and the House of Commons, over the famous case of Skinner *v.* The East India Company. From that time it has received appeals from the Court of Chancery, and it had previously received them from the Court of Exchequer, and from the King's Bench of England, as well as of Ireland. Under the acts of the union with Scotland, the House of Lords became the final court of appeal from the highest Scottish tribunals. The Judicature Act of 1873 threatened an interruption of the judicial functions of the Lords, but, before the time appointed for this event arrived, another statute provided for the maintenance of the House in its former position. As a court of last resort, the House of Lords is a small body. It consists of the law lords only. These are the Lord Chancellor; the peers who have previously held that office; those who are holding or who have held the Lord Chancellorship of Ireland, or the office of paid judge of the judicial committee of the Privy Council, or of judge of one of his Majesty's superior courts, and of the Lords of Appeal in Ordinary. Consult the authorities referred to under COURT; CONSTITUTIONAL LAW. See PARLIAMENT; JUDICATURE ACTS.

LORD'S DAY. See SUNDAY.

LORDSHIP. In the most general sense the status of a lord (*princeps* or chieftain). In the more restricted sense of English feudal law the jurisdiction or authority which a lord wielded over the persons settled on or belonging to his estate (demesne, domain). In later English law the term comes to be appropriated to the estate itself, especially if of great extent. In this sense a manor might be called a lordship. More often we find the term applied to the territorial area of two or more manors held by a single lord and over which he was entitled to exercise his seignorial rights. This was also known as an honor (q.v.).

LORDS JUSTICES OF APPEAL. The justices constituting the Court of Appeal, the appellate division of the Supreme Court of Judicature in England. The title was created by an amendment to the Judicature Act in 1877, which provided that the ordinary judges of the Court of Appeal should bear the above title. See JUDICATURE ACTS.

LORDS OF APPEAL IN ORDINARY. Certain members of the judicial committee of the Privy Council in England, who are appointed by the crown for the purpose of assisting that body in the hearing of appeals. The office was created by the Appellate Jurisdiction Act of 1876 (39 and 40 Vict., c. 59). To be eligible to such appointment a person must have occupied one of the high judicial offices of the Supreme Court of Judicature, or have been a practicing barrister in England or Scotland for not less than 15 years. Such an appointee ranks as Baron, with the above title, and is entitled to sit and vote in the House of Lords while he continues in office. His appointment is for life or during good behavior, but he may be removed by the joint action of both Houses of Parliament. See JUDICATURE ACTS; PRIVY COUNCIL.

LORDS OF THE ISLES. See ISLES, LORDS OF THE.

LORD'S PRAYER. The traditional title given to the prayer taught to his disciples by Jesus (Matt. vi. 9–13; Luke xi. 2–4), known in the older Catholic churches by its opening words, *Pater Noster*, as in the German churches by *Vaterunser*. The form and the occasion of this prayer are reported differently in the two Gospels which contain it. In Matthew it is found in the Sermon on the Mount. According to Luke it was given later in answer to a request of one of the disciples (Luke xi. 1). Luke's version, according to the best manuscripts, differs from Matthew's (1) in being shorter and (2) in a differing phraseology for some of the petitions which they have in common. When the two are placed side by side, the differences are noticeable, thus:

MATTHEW	LUKE
Our Father	Father,
Who art in heaven,	
Hallowed be thy name.	Hallowed be thy name.
Thy kingdom come.	Thy kingdom come.
Thy will be done,	
As in heaven, so on earth.	
Give us this day	Give us day by day
Our daily bread.	Our daily bread.
And forgive us our debts,	And forgive us our sins;
As we also have forgiven our debtors.	For we ourselves also forgive every one that is indebted to us.
And bring us not into temptation,	And bring us not into temptation.
But deliver us from the evil [one?].	

(The best manuscripts omit the doxology in both Gospels.)

There is no inherent impossibility that the differences in form are due to the fact that the prayer was given on two occasions; but the presence in both forms of the unusual word "daily" (epiousios) is almost certain evidence that both forms have been derived from a common source. This source is most likely to be the Perean Document, which Luke has incorporated into his narrative between ix. 50 and xx. 1 (see LUKE, GOSPEL OF), and from which the compiler of Matthew has made frequent excerpts of Jesus' sayings, which he has distributed among his longer discourses. (See MATTHEW, GOSPEL OF.) But if Luke has in this case followed his usual custom of reproducing his special sources without alteration, it follows that, as far as this Perean source is concerned, Luke's form of the prayer is primary and Matthew's secondary, i.e., Luke has reproduced it unmodified, while the compiler of Matthew has modified the form which he found in the source. Whether this Perean source is primary as far as Jesus' actual words are concerned is, however, another question. It may be that the compiler has in this case conflated with the form which he found in the Perean Document a form which he may have had in Matthew's collection of sayings and discourses of Jesus (the *Quelle*), adding such characteristics of his own, as "who art in heaven," and correcting such inconsistencies as "sins" and "indebted to us" to "debts" and "debtors." The earliest witness to the prayer outside of the New Testament (the *Teaching of the Twelve Apostles*, of the first or early in the second century) agrees with Matthew, except that it has a doxology attached.

It is altogether likely that Jesus taught the prayer in Aramaic, the mother tongue of himself and the disciples. The Greek, as we have it in the Gospels, is, then, a translation made some time after the prayer in its original Aramaic had become widely known and read.

Two phrases demand special mention. The word translated 'daily' is ἐπιούσιος, a rare word, apparently coined by the first translators of the prayer from the original Aramaic. Its exact meaning is disputed. According to philological rules it should come from ἐπί + ἰέναι, and mean 'coming,' i.e., 'for the morrow,' 'sufficient until the morrow.' But many, following Origen, prefer to derive it from ἐπί + εἶναι (to be), meaning 'present,' i.e., 'for to-day,' 'sufficient for the present needs.' On the basis of the Greek alone no satisfactory conclusion can be reached. The old Latin version translated the term by *quotidianum*, i.e., 'daily,' which the Vulgate retained in Luke, but changed to *supersubstantialem*, i.e., 'necessary to life,' 'essential to existence,' in Matthew. *Quotidianum* is evidence that in very ancient times the idea in ἐπιούσιος was thought to be temporal, not qualitative. The old Syriac rendering, 'the continual bread of the day,' reflects the same conviction. The later Syriac version, like the later Latin, changed the translation to 'necessary.' Jerome says that the old Gospel of the Hebrews read *màḥār*, i.e., 'to-morrow' (bread of, or for, to-morrow). It is therefore probable that Jesus (speaking Aramaic) said the equivalent of 'bread for the coming day,' and that the first translators rendered this into Greek by ἐπιούσιος, a word coined under the influence of ἡ ἐπιοῦσα, 'to-morrow' (cf. Acts vii. 26). So understood, the teaching is that we should in simple faith ask God to supply our daily needs (bread), being not over-anxious for the morrow's supply (cf. Matt. vi. 34).

The other term is "the evil" in the last petition. The point in dispute is whether the words τοῦ πονηροῦ should be considered masculine (the evil one) or neuter (evil). The usage of the LXX and the New Testament is not conclusive, but may be said, on the whole, to favor the masculine. The most ancient versions also appear to have taken this view, which is the one adopted in the Revised Version.

The extent to which this prayer was original with Jesus has been keenly disputed. It was once claimed that he drew all its material from current Jewish prayers. This was met by a counterdenial of as sweeping a character. The truth is that some of the phrases and some of its ideas are to be found in rabbinical literature, but for the most part this literature is of later date than the times of Jesus. As a matter of fact, Jesus' originality lay not only in the new elements he contributed to the expression of the current religion of the Jewish people, but in what he omitted of the formal elements which had been incorporated into it, and in the remarkable recovery of the spiritual elements which all along had been essential to it.

Jesus did not intend this prayer to be used as a fixed form, but as a model which should be corrective of the current pharisaic forms and suggestive of the spirit of the Kingdom which he had come to establish. But inevitably and at a very early time it came to be used liturgically. There are hints that this was the case even in New Testament times. The earliest Church manual, the *Didache* (see TEACHING OF THE TWELVE APOSTLES) (c.100 A.D.), includes it, directing that it be said thrice each day. The most ancient liturgies, with one exception, contain it, giving it a place in the eucharistic services between the consecration of the elements and the communion. The liturgical use led to the addition of the doxology, the earliest-known form of which (in the *Didache*) is "For Thine is the power and the glory forever." The (longer) doxology in common use is not found joined to the prayer in any writer before Chrysostom.

Bibliography. Of the very large literature, the following works are of special importance. Many of the fathers, e.g., Tertullian, Origen, Chrysostom, Augustine, and Jerome, wrote on the Lord's Prayer. Extended expositions of its teaching are given in the great catechisms, such as Luther's, the Heidelberg, the Westminster, the catechism of the Eastern church, and others. Modern scholarly discussions are offered by Adolf Kamphausen, *Das Gebet des Herrn* (Elberfeld, 1866); J. B. Lightfoot, *On a Fresh Revision of the New Testament* (London, 1881); Cook, *Deliver us from Evil: A Letter to the Bishop of London* (ib., 1881); id., *A Second Letter, etc.* (ib., 1882); F. A. G. Tholuck, *Bergpredigt* (Hamburg, 1883); Bernard Weiss, *Life of Jesus*, translated from the German (Edinburgh, 1883–84); Chase, *The Lord's Prayer in the Early Church, in Texts and Studies*, vol. i (Cambridge, 1891); H. H. Wendt, *Teachings of Jesus*, translated from the German (New York, 1892); Jannaris, "The English Version of the Lord's Prayer," in the *Contemporary Review* (London, 1894); E. A. Von der Goltz, *Das Gebet in der ältesten Christenheit* (Leipzig, 1901); Bindemann, *Das Gebet um tägliche Vergebung der Sünden in der Heilsverkündigung Jesu und in den Briefen der Apostel* (Gütersloh, 1902). C. E. Nestle, in *Encyclopædia Biblica*, vol. iii (London, 1902); id., in *Dictionary of Christ and the Gospels* (ib., 1908); Alfred Plummer, in Hastings, *Dictionary of the Bible*, vol. iii (New York, 1914). For detailed list of writers, see literature appended to Nestle's article in *Dictionary of Christ and the Gospels*, above.

LORD'S SUPPER. A term widely applied to the principal sacrament of the Christian Church. This name, however, appears originally to have referred to the *agape*, or love feast (see AGAPÆ), which was closely connected, if not combined, with the celebration of the sacrament in the early Church and was probably used by St. Paul in this sense in 1 Cor. xi. 20. The commonest designation in the early Church for the sacrament was eucharist, or thanksgiving (cf. Luke xxii. 19; 1 Cor. xiv. 16; Tim. ii. 1). It was employed by Ignatius in his epistles (107 A.D.), by Irenæus, who says that the bread after consecration "is no longer common bread, but eucharist," and by Justin Martyr (140 A.D.). Another term employed in the English and American prayer books is Holy Communion, from the Greek *κοινωνία* (1 Cor. x. 16, where it means 'communication' or 'impartation').

As described in the synoptic Gospels and in 1 Cor. xi. 23–27, the sacrament was instituted by Christ on the eve of his passion, at the last supper or paschal feast which he kept with the Twelve. For a discussion of the New Testament notices concerning the institution, see GOSPEL, *The Lord's Supper*.

As to its origin the great sacrament was wholly Jewish. Any other suggestion, according to a most recent authority, is quite unhistorical. "It was developed out of the rites and associations of the paschal sacrifice and meal." As the Jewish Passover was a memorial of the deliverance of God's ancient people from the bondage of Egypt and of their covenant relationship with Him, so the Christian sacrament of the Lord's Supper became a solemn memorial of man's emancipation from the thralldom of sin and his place in the new covenant of the Saviour's blood.

Some theologians have traced an analogy between the Christian sacraments and the Greek mysteries. They have even discussed the question whether the ideas which are most characteristic of the mystery worship were directly borrowed by the Church or arose spontaneously in the latter under the same influences which produced them in the former. Others, again, have repudiated any connection between the eucharistic feast and the "sombre, cruel, and revolting ceremonies" of the heathen forms of worship, and Justin Martyr says that in the mysteries of Mithra "the evil spirits have instituted by imitation a rite similar to the Christian eucharist." It is quite certain, however, that Greek social custom influenced the growth of the love feast, and that mystery religions lent their influence to the development of sacramental ideas regarding the eucharist. Sacrificial notions of Jews and Gentiles also had their influence. Sacrificial terms remained and grouped themselves around the Lord's Supper. It was spoken of as a *προσφορά*, or oblation, as a *θυσία*, or sacrifice, and as an *ἀνάμνησις*, or memorial. The term *hostia* (victim, host) crystallized the same idea for later times.

Viewed objectively, it early became the central act of worship of the Christian Church. The feast was kept every Lord's Day, or even more frequently. Around the Lord's Supper gathered and grew the ancient liturgies of the Christian faith. It attracted to it all that was richest and best in symbolic ceremony and holy song.

Subjectively it became the Church's greatest and most precious means of grace. The symbolism of food received a mystical interpretation. As in the physical life the waste of bodily tissues is repaired by food, so in the spiritual life the waste in the finer tissues of man's higher nature was said to be repaired by the body and blood of Christ. The spiritual nourishment—the divine element—in the sacrament soon came to be understood as in some real sense the body and blood of the Saviour, and by receiving it Christians believed themselves to be united to God and to one another in Jesus Christ.

This is made plain by Justin Martyr. After giving a detailed account of the service as it was celebrated in his day, including the distribution, among those present, of the loaf and the wine and water, he says: "And this food is called among us eucharist, and no one is allowed to take it unless he believes that what we teach is true, and has been washed in the laver for the remission of sins and for regeneration, and is living as Christ enjoined. For we do not receive these things as common bread or common drink, but just as Jesus Christ our Saviour, by the word of God made flesh, had both flesh and blood for our salvation, so we have been taught that the food over which thanks have been given by the word of prayer which comes from him—that food from which our flesh and blood are by assimilation nourished—is both the flesh and the blood of that Jesus who was made flesh."

The early fathers were not trained theologians. They were not careful and precise in their language regarding the Lord's Supper. They constantly use terms which imply the real presence of Christ in the sacrament, but how far this was conceived in any literal way it is difficult to say. The schoolmen, on the other hand, were philosophers. They aspired to reduce the Church's body of doctrine to an intellectual system. They sought to show that the doctrine of the Eucharist involved no rational antagonism. Speculation, too, was rife; and it naturally found expression in the language of the dominant or Aristotelian school of philosophy. The result was the metaphysical doctrine of transubstantiation. The term was first officially used by the Latin church at the Lateran Council of 1215, and the doctrine became her recognized and authoritative teaching, so defined by the action of the Council of Trent (1551 A.D.).

The Reformers, who rejected the doctrine of transubstantiation, met the same difficulties as the schoolmen and found it impossible to explain the mystery of the sacrament. The doctrine of transubstantiation, at least as popularly understood, annihilated the natural. The bread and wine were, to all intents and purposes, no longer present. But Zwinglianism destroyed the supernatural and made the Lord's Supper a symbol or bare memorial of a past event.

Another view, commonly called the Lutheran, was known as consubstantiation. The word appears to have been coined by the opponents of Lutheranism and was derived from an expression of Luther's in his letter to Henry VIII. It represents the substance of the body and blood of Christ as coexisting in union with the substance of bread and wine, just as iron and fire are united in a bar of heated iron.

The opinion which sought to establish a "via media" between transubstantiation and consubstantiation, on the one hand, and Zwinglianism on the other hand, is known as the Receptionist theory. It was held by the Reformed churches and is expressed in Calvin's *Institutes.* This view recognized a presence, but insisted on its being spiritual as opposed to material. But, in the last analysis, it must be admitted that this presence, according to Calvin and his followers, was not in the sacrament itself and by virtue of the act of consecration, but in the heart of the recipient and by virtue of an act of faith on his part. This view ignored the objective supernatural element in the sacrament, as did Zwingli's, but preserved and cherished the *virtus* or *beneficia*, and hence has been designated by some writers as "virtualism."

Another view, and one held largely among the High Church section of the Anglican communion, is known as the Objective Real Presence. The adjective has been inserted in the definition as a safeguard against virtualism. Dr. Pusey says: "Finding that the words Real Presence were often understood of what is in fact a real absence, we added the word 'objective,' not as wishing to obtrude on others a term of modern philosophy, but to express that the life-giving body, the *res sacramenti*, is, by virtue of the consecration, present without us to be received by us, in the words of the Fathers, 'for us to lay up Christ in ourselves, and place the Saviour in our breasts.'" The Presence he calls "sacramental, supernatural, mystical, ineffable, as opposed not to what is real, but to what is natural."

For the development of the service used in connection with the sacrament, see LITURGY; for details relating to communion, see SACRAMENT; COMMUNION IN BOTH KINDS; for fuller exposition of the Roman Catholic teaching, see MASS; TRANSUBSTANTIATION. As to the materials used, it may be said that bread and wine made from the juice of the grape have always been required, the latter mixed with water in the ancient historic churches; though the sects of the Encratites and Elkesaites substituted water for the wine, and many nonliturgical churches use unfermented grape juice. The Christians of St. Thomas in India and the Syrian Christians mixed oil and salt with the bread. Unleavened bread has been used in the Western church from an early date, probably by analogy with the usage of the Passover; the Eastern church still employs leavened bread. As to the frequency of the observance of the rite, it may be said that it is celebrated very frequently, if not daily, in the Roman Catholic and Eastern churches; in the Anglican communion the result of the Oxford movement has been to increase the frequency, so that it is generally celebrated bimonthly or weekly and in many places daily; the Nonconformist churches have usually reduced it to once a month, or quarter, or year.

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the Doctrine of the English Church Concerning the Eucharistic Presence (2 vols., ib., 1911); W. M. Groton, *Christian Eucharist and the Pagan Cults* (New York, 1914).

LORD'S SUPPER, THE, also called THE LAST SUPPER. A favorite subject with painters of the Renaissance and succeeding epochs. The nature of the subject adapted it to painting rather than to sculpture, and it was most often depicted in the refectories of the monasteries. It was painted by practically all the great Italians, beginning with Giotto and Duccio. Among the most celebrated examples of the subject were those of Andrea del Castagno, in the refectory of Sant' Apollonia, Florence; Ghirlandaio, in San Marco, Florence; Signorelli, in the cathedral of Cortona; and Andrea del Sarto, in San Salvi, Florence. It was a favorite subject with Tintoretto, the best examples of whose versions are in San Giorgio Maggiore and the Scuola di San Rocca. The finest specimens painted by the early Netherlanders were those by Dierick Bouts in St. Peter's, Louvain, and by Justus of Ghent in the gallery of Urbino; by early Germans, those of Lucas Cranach in the church of Wittenberg—a curious version with portraits of Luther, Melanchthon, and other Reformers, and by Hans Holbein the Younger in the Basel Museum. Among the Spanish of the sixteenth century it was a favorite subject with Juan da Juanes (cathedral of Valencia, Prado Museum, Madrid). The best-known French example of the seventeenth century is that by Philippe da Champagne in the Louvre, and among moderns the subject has been most remarkably rendered by Eduard van Gebhardt (National Gallery, Berlin). By far the most celebrated version of the subject, and the one which has become typical for all art, is the decoration by Leonardo da Vinci on the wall of the refectory of Santa Maria delle Grazie, Milan. It was painted (1494–98) in tempera (not in oil, as is usually supposed), directly on the walls, which process accounts for the ruined condition of the painting. The neglect of the monks, the vandalism of the soldiers, particularly during the Napoleonic wars, when the refectory was used as a cavalry barracks, and, most of all, three separate restorations in the eighteenth and nineteenth centuries conspired to ruin the painting. In 1904–08, however, it was subjected to a scientific and modern restoration by Cavenaghi, in which the repainting was removed, the flaked color attached to the wall, and the bare spots touched with tempera. Of the numerous copies made the most faithful are two by Marco Oggione—in the Hermitage, St. Petersburg (Petrograd), and the Royal Academy, London. The painting is most widely known through the engraving by Raphael Morghen. For a description and criticism of the painting, see VINCI, LEONARDO DA. See also the biographies of the other artists mentioned above. Consult P. D. C. Wirz, *The Holy Eucharist in Art* (New York, 1914).

LORD ULL′IN'S DAUGHTER. A highland ballad written by Thomas Campbell (1809). It was a favorite in the early part of the nineteenth century. George Thomson set it to music.

LOREBURN, LORD. See REID, R. T.

LOREE, LEONOR FRESNEL (1858–). An American railroad president, born at Fulton City, Ill. Graduating C. E. from Rutgers College in 1877, he became a member of an engineer's corps on the Pennsylvania Railroad; was a transitman in the Engineer Corps of the United States army in 1879–81; and then resumed railroad engineering work, chiefly with the Pennsylvania Railroad, of which he was a division superintendent (1889–96), general manager (1896–1901), and fourth vice president (1901). He served as president of the Baltimore and Ohio Railroad in 1901–04, of the Rock Island Company of New Jersey in 1904, and of the Delaware and Hudson Company and related companies after 1907. He held also directorships and interests in many other railroads and corporations. From 1899 to 1901 he was president of the American Railway Association, and in 1900 acted as chairman of the United States delegation to the International Railway Congress at Paris. He also became one of the seven American members of the permanent commission of this congress.

LORELEI, lō′re-lī, or **LURLEI,** lōōr′lī. A steep rock on the right bank of the Rhine, about 430 feet high, a little above Sankt Goar, where the river narrows to 180 yards, formerly dangerous to navigation. It is celebrated for its echo, which has given rise to the legend of the siren, a favorite theme with the German poets and exquisitely treated by Heine. The rock is pierced by a railroad tunnel.

LORENTZ, lō′rĕnts, HENDRIK ANTOON (1853–). A Dutch physicist, born in Arnheim. He was educated at the University of Leyden, and after teaching from 1872 to 1877 in the Arnheim evening school became professor of mathematical physics at the university of that place. His great work was as one of the developers of Maxwell's theory of the ether, and as a founder with Thomson of the electron theory. In 1880, simultaneously with L. V. Lorenz of Copenhagen, he arrived at the so-called Lorenz-Lorentz formula for the function of refraction. He worked with Zeeman and both predicted and in 1896 explained the "Zeeman effect" (q.v.) by proving that the radiating centres were electrons. In 1902 the Nobel prize for physics was divided between Lorentz and his pupil Zeeman. Lorentz gave a course of lectures at Columbia in 1906 and one in the Collège de France in 1912–13. He published: *La théorie électromagnétiques de Maxwell* (1892); *Versuch einer Theorie der elecktrischen und optischen Erscheinungen in bewegten Körpern* (1895); a *Text-Book of Differential and Integral Calculus* (1882; German by Schmidt, 1900; 2d ed., 1907); *A Textbook of Physics* (1888–90; German version, 1906–07); *Zichtbare en onzichtbare bewegingen* (1901; German version, 1902); *Abhandlungen über theoretische Physik* (1907); *The Theory of Electrons* (1909). Lorentz directed the Dutch scientific expeditions of 1907 and 1909 to New Guinea; the results were still being published in 1914.

LORENZ, lō′rĕnts, ADOLF (1854–). An Austrian orthopædic surgeon. He graduated from the University of Vienna in 1880 and obtained the post of assistant to Professor Albert, who then occupied the chair of surgery at the university; later he succeeded Albert. Lorenz had intended to become a general surgeon. Professor Albert advised him to take up orthopædic surgery, which was then comparatively new in Vienna, and which consisted mainly in exercise and bracing. The operation which made him famous—the so-called "bloodless" reduction of congenital dislocation of the hip joint—was developed only after years of experiment with other methods. Beginning with the "open" method of Haffa, he modified it by stretching and parting instead of cutting the muscles—the Haffa-Lorenz operation—and finally in 1892 conceived the idea of reducing the hip by manipulation alone. In 1895 he demonstrated the method before the medical congress at Berlin, and it found general acceptance. In 1902 he visited the United States and England; he demonstrated his methods in both countries. He devised several other orthopædic operations besides that for the reduction of hip dislocations (notably one for the straightening of clubfoot) and invented several instruments. His more important works are: *Orthopädie der Hüftgelenks-Kontrakturen und Ankylosen* (1889); *Ueber die unblutigchirurgische Behandlung der angeborenen Hüftverrenkung mittels der functionellen Belastungsmethode* (1896); *Das instrumentelle kombinierte Redressement der Hüftgelenks-Kontrakturen* (1898); *Ueber die Heilung der angeborenen Hüftgelenks-Verrenkung durch unblutige Einrenkung und functionelle Belastung* (1900); with Saxl, *Orthopædics in Medical Practice*, translated by L. C. P. Ritchie (New York, 1913).

LORENZ, Ottokar (1832–1904). An Austrian historian, born in Iglau, Moravia. He was educated in Vienna and was appointed professor of history in the university there in 1860. In 1857 he received a government appointment in the Department of Secret Archives, which he was compelled to relinquish in 1865 on account of indiscreet disclosures. In 1885 he was called to the University of Jena. His works include: *Deutsche Geschichte im dreizehnten und vierzehnten Jahrhundert* (1863–67); *Deutschlands Geschichtsquellen im Mittelalter seit der Mitte des dreizehnten Jahrhunderts* (3d ed., 1886–87); *Papstwahl und Kaiserthum* (1874); *Goethes politische Lehrjahre* (1893); *Staatsmänner und Geschichtschreiber des 19. Jahrhunderts* (Berlin, 1896); *Friedrich, Grossherzog von Baden, zum 50jährigen Jubiläum* (Berlin, 1902); *Kaiser Wilhelm und die Bergründung des Reichs 1866 bis 1871* (Jena, 1902).

LORENZETTI, lō′rĕn-tsĕt′tē, Pietro and Ambrogio, brothers, important Sienese painters of the late Middle Age. They were the first to introduce an essentially descriptive style in place of the old monumental style into Sienese art. The eldest, Pietro (active 1305–48), was a native of Siena, studied there under Simone Martini and was later influenced by Giovanni Pisano. His early works reveal keen sense of beauty and deep religious sentiment, but this degenerated later into a superficial execution and an exaggerated expression of emotion. Good examples of his early manner are the large polyptych (1320) of the cathedral of Arezzo, and a Madonna and Child with Sts. Francis and John in the Lower Church at Assisi, the latter a fresco of exquisite, enamel-like finish and tender sentiment; while his decline is plainly visible in the frescoes of the "Passion" in the same church. Among the best of his other panels are the altarpiece in the church of Sant' Ansano (1328) and scenes from the life of St. Humilitas (1316) in the Florence Academy and Berlin Gallery.

His more talented brother and pupil, Ambrogio (active 1323–48), was influenced also by Giovanni Pisano and by the frescoes of Giotto. He was more realistic than his brother; his art is less uneven and shows constant progress. Among his best panels are an altarpiece with the Madonna, Virgin, and Saints and an "Annunciation" in the Siena Academy; "St. Catherine and St. Francis," in the Opera del Duomo, Siena; a little-known altarpiece at Massa Marittima, Tuscany, and "St. Nicholas" (1332), in the Florence Academy. They show unbroken the tradition of the Sienese school as perfected by Duccio, enhanced by an essential naturalism, and rank at best with the most perfect products of the school. Ambrogio's famous frescoes in the Palazzo Pubblico at Siena (1338–40), illustrating "Good and Bad Government," are a collection of quaint episodes, furnishing a mass of interesting historic information, and executed with high technical skill, especially as regards color. Some figures, especially the reclining figure of "Peace," are unique and attractive. The Fogg Museum, Harvard University, has recently acquired a "St. Agnes" attributed to Ambrogio.

By far the most important follower of the Lorenzetti was the unknown painter of the famous fresco in the Campo Santo of Pisa, "Triumph of Death," so eloquently described by Goethe, Ruskin, and others. It combines vigor of execution with a humor and satire unique in Italian art.

Consult Crowe and Cavalcaselle, *History of Italian Painting*, especially the notes, in the editions by Douglas and Strong (London, 1903) and by Edward Hutton (ib., 1910).

LORENZO DE' MEDICI, lô-rĕn′tsô dâ mā′dē-chē. See Medici.

LORENZO DI PIETRO, dē pyā′trô. See Vecchietta, Lorenzo.

LORENZO MARQUES, lô-rāɴ′zô mär′kĕsh. See Lourenço Marques.

LORENZO MONACO, lô-rĕn′tsô mŏn′ȧ-kô, also called Don Lorenzo (c.1370–1425). An Italian painter of the transition from the Middle Age to the Renaissance. He was born probably at Siena or possibly at Florence, where he spent the greater part of his life as a Camaldolese monk in the monastery of Santa Maria degli Angeli, taking the vows in 1391. He was a follower of Agnolo Gaddi and the Sienese school. The influence of the former is most evident in the earliest of his surviving works, while that of the latter appears in the series of madonnas painted between 1400 and 1408, examples of which are in the Metropolitan Museum, New York, the Berlin Gallery, and the Collegiate Church at Empoli. Lorenzo later developed an individual style distinguished by stately composition, rhythmic line, and deep religious feeling. To this period belongs his only signed work, a triptych of 1413 once in the abbey of his order at Ceretto, near Certaldo, and now in the Uffizi Gallery. It represents the "Coronation of the Virgin" and contains many figures. Other late works are: an "Adoration of the Kings," in the Uffizi Gallery, Florence, and an "Annunciation" and frescoes from the "Life of the Virgin," in the Bartholini Chapel, Santa Trinità, Florence. Some of his miniatures are preserved in the Biblioteca Laurenziana in Florence. He exercised a wide influence as a teacher, especially on the monastic painters. Fra Angelico was much influenced by him and Filippo Lippi was his pupil. Consult the monograph by Siren (Strassburg, 1905).

LORENZO STECCHETTI, lô-rĕn′tsô stĕk-kĕt′tē. A pseudonym of the Italian poet Olindo Guerrini (q.v.).

LORETA, lô-rā′tȧ, Pietro, Count (1831–89). An Italian surgeon, born in Ravenna and educated at Bologna. In 1861 he was made anatomical prosector to Calori at Bologna; in 1865 he took charge of the surgical clinic, and in 1868 became professor of surgery in the University of Bologna. A famous surgeon, he is best known for his device of dilatation of the pylorus for cancer. Loreta wrote: *Nuovo metodo di cistotomia perineale; Nuovo methodo di cura degli aneurismi; La divulsione digitale del piloro; La divulsione instrumentale del cardia; La resizione del fegato.*

LORETO, lȯ-rā'tȯ. An episcopal city of the Province of Ancona, Italy, 15 miles by rail southeast of Ancona (Map: Italy, D 3). It is one of the great Catholic pilgrimage resorts, being visited by more than 50,000 annually. Its chief interest lies in the possession of the *Santa Casa*, reputed to be the house in which Christ lived at Nazareth with his mother and Joseph and to have been built by St. Luke. The large, fine church of the Holy House inclosing it has a fine bronze statue of the Virgin and Child by Girolamo Lombardo and stands in a square in which are also the Governor's Palace, designed by Bramante, and a fine bronze statue of Sixtus V. The house itself is plain, of stone, and very small. Pop. (commune), 1901, 7845; 1911, 7066. The town has been the see of a bishop since 1586. The legend as to the Holy House asserts that in 1291, after the Holy Land was abandoned to the Saracens, the house was carried by angels to Raunitza, on the Dalmatian coast, and as mysteriously transferred to its present site three years later.

LORETO. A department of Peru, occupying the northeastern part of the Republic, and bounded on the north by Ecuador and territory claimed by the countries of Ecuador and Colombia, on the east by Brazil, on the south by the Peruvian departments of Cuzco and Huánuco, and on the west by the departments of Amazonas and Libertad (Map: Bolivia, B 5). The boundaries are imperfect, and the area cannot be estimated with any degree of accuracy. Official estimates give it as 288,531 square miles. The western part adjoining the settled portion of the Republic belongs to the region of the Andes. The eastern part lying between the Andes and the Javary River, which forms the east boundary, is very little known. It is traversed from south to north by the two tributaries of the Marañon, the Hullaga and the Ucayali, and is supposed to be mostly flat, with occasional ranges of hills. The greater part of the department is covered with thick forests and the climate is hot and unhealthful. The chief products are rubber, salt, quinine, tobacco, and tropical fruits; the river beds are supposed to contain rich gold deposits. The population is estimated at 120,000, consisting mostly of civilized Indians inhabiting the northwestern portions. The eastern forest regions are inhabited only by Indians, whose numbers are unknown. The capital is Iquitos (q.v.).

LORETO, LITANY OF. See LITANY.

LORETO, OUR LADY OF. A wooden statue of the Virgin in the *Santa Casa* (q.v.) at Loreto, Italy. It is reputed to be the work of St. Luke. The image was removed to France in 1797 and was returned in 1803.

LORETTE ANCIENNE, lȯ'rĕt' äɴ'syĕn'. A village of Quebec Co., Quebec, Canada, 7 miles west-southwest of the city of Quebec, on the Canadian Pacific Railroad (Map: Quebec, G 4). It contains extensive works in connection with Lake Charles, the source of Quebec's water supply. Pop., 1911, 1588. It was the refuge of the Huron Indians after their defeat at Lake Huron in 1650, and some 300 Christianized descendants occupy INDIAN OR JEUNE LORETTE, 3 miles north, to which their ancestors were removed in 1697. Their village contains a reproduction of the famous chapel and statue of the Virgin at Loreto, Italy, and is frequented for its ethnological interest, the fine view of Quebec, and the picturesque falls of Lorette.

LORETTO, lȯ-rĕt'ȯ, *Ital. pron.* lȯ-rȧt'tȯ, SISTERS OF. A Roman Catholic sisterhood, founded in 1812 by Charles Nerinckx, a Flemish missionary priest (1761–1824), in Marion Co., Ky. The constitution was fully and finally confirmed by Pius X in 1907. The order, whose full name is Sisters of Loretto at the Foot of the Cross, is devoted to the cause of education and the care of destitute orphans, and has many establishments in the Western States. It numbered (1914) 682 sisters, 29 novices, and 25 postulants, and had 76 academies and parochial schools, with about 13,000 pupils. The mother house is at Loretto, Marion Co., Ky.

LORGUES, lôrg, ANTOINE FRANÇOIS FÉLIX ROSELLY DE. See ROSELLY DE LORGUES.

LORIA, lō'rē-ȧ, ACHILLE (1857–). An Italian economist, born at Mantua. After completing a course of legal study at Bologna he studied economics at Rome, Berlin, and London. In 1881 he was appointed professor extraordinary of economics at Siena, in 1891 professor of economics at the University of Padua, and in 1903 professor at Turin. Loria became known as a brilliant economist of that school which seeks to explain the essential facts of history by reference to economic conditions. In his view, a study of the forms of land tenure gives a key to the problems of progress. His sympathies are with the Socialists, but, unlike them, he endeavors to show that natural forces will eventually give to the laborer his just reward. His principal works are: *La rendita fondiaria e la sua elisione naturale* (1880); *La legge di popolazione ed il sistemà sociale* (1882); *La teoria del valore negli economisti italiani* (1882); *Carlo Darwin e l' economia politica* (1884); *La teoria economica della costituzione politica* (1886); *Analisi della proprietà capitalista* (1889); *Studii sul valore della moneta* (1891); *La terra ed il sistema sociale* (1892); *La costituzione economica odierna* (1889; Eng. trans., *Contemporary Social Problems*, 1911); *Il capitalismo e la scienza* (1901); *La scutesi economica* (1909; Fr. trans., 1911; Eng. trans., *The Economic Synthesis*, 1914); *Le basi economiche della costituzione societa* (4th ed., 1912; Fr., Ger., and Eng. trans., the Eng. as *Economic Foundations of Society*, 1899).

LORIA, R. DE. See LAURIA, R. DE.

LORI'CA. The Roman name for a breastplate. See ARMOR; LEGION.

LOR'ICA'TA (Neo-Lat. nom. pl., from Lat. *loricatus*, p.p. of *loricare*, to clothe in mail, from *lorica*, coat of mail, from *lorum*, thong), or LORICATI. A term which has been used in many departments and periods of zoölogy to express the prevailing scaled characters of a group. Among mammals it has designated the armadillos. Among reptiles it is synonymous with Crocodilia; and in ichthyology it has been applied both to the ganoid fishes and to "mail-cheeked" cottoids, and is still used for the latter by Jordan and Evermann. Similarly the term has been applied in conchology to the mail-shells or chitons, and to sundry crustaceans, worms, and infusorians which have loricate coverings.

LORIENT, lŏ′rē′äɴ′, or **L'ORIENT.** A first-class fortress and one of the important naval ports of France, situated in the Department of Morbihan, on the Scorff, at its confluence with the Blavet, 104 miles by rail southeast of Brest (Map: France, N., B 5). The extensive and well-protected harbor is divided into the commercial and the naval harbor. The former is equipped with a dry and a floating dock and is accessible to vessels of the heaviest draft. The naval dockyards occupy a very large area and inclose an arsenal, nine large and two small wharves, and numerous machine shops, foundries, boiler works, and rope factories. The shipbuilding yards cover more than 38 acres. At the entrance to the harbor, 3 miles from the town, are three forts and a powder magazine. The town has a number of private iron foundries, engine works, tanneries, chemical works, manufactures of sardine tins, passementerie, and conserves. Timber is exported and coal brought in. The fisheries of Lorient are of great value, large quantities of sardines being exported and more than 10,000,000 oysters raised yearly. Among the educational institutions of the town are a lycée, a naval school, a library, a museum, and an observatory. Lorient was founded by the French East India Company in 1666 and became a military port in 1690. The shipbuilding establishments were bought by the state after the collapse of the company in 1782. Pop., 1901, 44,640; 1911, 42,463.

L'ORIGNAL, lŏ′rē′nyȧl′. A town and the county seat of Prescott Co., Ontario, Canada, on the right bank of the Ottawa River and on the Canadian Northern Railway, 50 miles east-northeast of Ottawa (Map: Ontario, K 2). There is steamship communication with Ottawa. It has a Roman Catholic convent. The chief industry is the manufacture of lumber. There is an electric-lighting plant. Pop., 1901, 1026; 1911, 1347.

LOR′IKEET, or **LORIQUET.** A diminutive of "lory," applied with little or no discrimination to any of the smaller species. See Lory.

LOR′IMER (OF. *lorimier*, *lormier*, from *lorain*, *lorein*, bridle, from Lat. *lorum*, thong). A name once given to a harness maker, or a maker of bits, spurs, stirrup irons, metal mountings for saddles and bridles, and generally of all articles of horse furniture. In London, the name survives in one of the city livery companies, the Lorimers, who had previously formed part of another guild and were incorporated by letters patent in 1712. In 1914 there were 305 liverymen and the guild had an income of £606. In the Scottish burghs they have been included as a branch of the corporation of hammermen.

LORIMER, lŏr′ĭ-mẽr, George Claude (1838–1904). An American Baptist minister. He was born in Edinburgh, Scotland, and attended school there. For several years he was associated with theatres. In 1855 he came to the United States, and shortly afterward joined the Baptist church and abandoned the stage. He graduated at Georgetown College, Kentucky; was ordained in 1859; and had a number of pastorates, the most notable of which were the Shawmut Avenue Church and Tremont Temple, Boston, Immanuel Church, Chicago, and Madison Avenue Baptist Church, New York, where he was minister the last two years of his life. He was for a time associate editor of the Baptist weekly journal, *The Watchman;* he edited *The People's Bible History Prepared in the Light of Recent Investigations* (1895); and among other works he published: *Under the Evergreens* (1872); *The Great Conflict* (1876); *Studies in Social Life* (1886); *The Argument for Christianity* (1894); *Messages of To-Day to the Men of To-Morrow* (1897); *The Modern Crisis in Religion* (1904).

LORIMER, George Horace (1868–). An American editor and author, born in Louisville, Ky. He was educated at the Mosley High School, Chicago, at Colby College, and at Yale, and subsequently devoted himself to editorial work and to writing. In 1899 he became editor in chief of the *Saturday Evening Post.* The immense and continued popular success of that periodical was largely due to the shrewdness and general editorial acumen with which Lorimer discerned the tastes of the great reading public. As a writer, he is perhaps at his best in *Letters from a Self-Made Merchant to his Son* (1902). The breezy, laugh-provoking humor of this book, with its mastery of the latest slang, its hard-headed common sense, and its crackling witticisms, made it a success of the hour. Other books by this author are: *Old Gorgon Graham* (1904); *The False Gods* (1906); *Jack Spurlock—Prodigal* (1908).

LORIMER, Peter (1812–79). An English Presbyterian. He was born in Edinburgh and was educated in that city, but from 1836 was connected with the ministry of the English Presbyterian church; he was professor of theology in its college in London (1844–78) and became principal in 1878. He deserves mention for his important monograph, *John Knox and the Church of England* (London, 1878), and his translation of Lechter's *John Wyclif and his English Precursors* (2 vols., London, 1878).

LORIMER, William (1861–). An American politician and capitalist, born in Manchester, England. His family, which was very poor, emigrated to the United States in 1866 and settled first in Michigan. Lorimer later removed to Ohio and finally to Chicago. He never attended school, and what education he acquired was obtained through his own efforts. He secured employment with the city water department, becoming superintendent finally of the water-main-extension department. In 1900 he entered a successful firm of building contractors. From this source and various financial ventures he gained wealth. While actively engaged in business, he also identified himself with politics. As a member of the Republican party, he was immensely successful as a ward politician. It was alleged that he was the boss of the Chicago Republican machine, and that, as such, he dictated nominations and policy. For himself he secured the nomination to Congress in 1894 and was elected, serving in the House of Representatives (with the exception of one term, 1901–03) from 1895 to 1909. In 1908 an advisory primary election for a United States Senator was held in Illinois, but Lorimer was not one of the four candidates. When the State Legislature came to select the Senator, there occurred a bitter contest; after 95 ballots had been cast Lorimer was elected through a coalition of 55 Republicans and 53 Democrats. Within a short time suspicion was aroused that corrupt practices had been employed to effect his election, and a legislative investigation was made which resulted in a scandal. Through the efforts of local citizens and the Chicago *Tribune*, a memorial was sent to the Senate demanding a Federal inquiry. The demand and charges were referred to the

Committee on Privileges and Elections, which made investigations and, in 1910, reported that the choice of Lorimer had "not been shown to be invalid." The emphatic dissent of a nonpartisan minority of the committee and hostile expressions of public opinion showed that the entire case would be taken before the Senate. In the following year the matter became the occasion for prolonged debate and discussion. In March of 1911, by a vote of 46 to 40, the Senate decided that Lorimer was entitled to his seat. The decision was decidedly unpopular in the country at large, and when Congress reopened resolutions calling for a new inquiry were adopted. The committee again exonerated Lorimer of complicity in the corrupt practices; but the Senate, after a bitter controversy, in 1912 declared that the election was invalid and Lorimer's seat vacated. The contest over this famous case was regarded by many to have been a conflict between the reactionary and progressive elements in the Senate, irrespective of party, and the whole matter may perhaps be said to have given an impetus to the movement to elect Senators by direct popular vote. On his retirement from public life Lorimer resumed his contracting and banking business. He had become president of the La Salle Street Trust and Savings Bank of Chicago in 1910. In 1914 that institution and a number of banks associated with it (known as the Lorimer-Munday chain of banks) failed, and Lorimer and several other officials were indicted, charged with misappropriation of the funds.

LORING, lō′ring, CHARLES GREELY (1794–1868). An American lawyer, born at Beverly, Mass. He graduated at Harvard in 1812, practiced law in Boston, became actuary of the Massachusetts Hospital Life Insurance Company in 1857, and in 1862 entered the State Senate. He wrote *Neutral Relations between the United States and England* (1863) and a *Life of William Sturgis* (1864). He was a man of great oratorical ability and a prominent member of the Massachusetts Historical Society.—His son, CHARLES GREELY LORING (1828–1902), was born in Boston, graduated at Harvard in 1848, served through the Civil War, and in 1865 retired with the rank of brevet major, U. S. V. In 1873 he became a trustee and in 1876 director of the Museum of Fine Arts, Boston.

LORING, CHARLES HARDING (1828–1907). An American naval engineer, born in Boston. He was educated in the public schools, served an apprenticeship as a machinist, and became third assistant engineer in the United States navy in 1851. At the outbreak of the Civil War he was chief engineer of the *Minnesota* and still served in that capacity when the *Minnesota* was damaged by the Confederate ironclad *Merrimac.* He then supervised the building of monitors. He became fleet engineer of the Asiatic Station, and member of the first Naval Advisory Board in 1881 and of the Navy Yard Board in 1882. From 1884 until his retirement in 1890, he was engineer-in-chief of the United States navy. During the Spanish-American War he served as an inspector of engineering work at New York. In 1892 he was president of the American Society of Mechanical Engineers.

LORING, ELLIS GRAY (1803–58). An American lawyer. He was born in Boston, prepared for college at the Boston Latin School, and entered Harvard in 1819, but left before graduation to study law. He was admitted to practice in 1827 and rose rapidly to a foremost place at the Boston bar. He openly advocated abolition, in 1833 was one of the 12 founders of the first Antislavery Society in Boston, and the author of its constitution. He offered his legal services freely in defense of fugitive slaves, thereby practically ostracizing himself from the circle of society in which he had been reared. His defense of the slave child Med before the Massachusetts Supreme Court was his most notable case. In this case he was opposed by Benjamin R. Curtis (q.v.), but succeeded in obtaining a decision of the court that every slave brought into Massachusetts was by that fact legally free, and presented his argument with such force and eloquence that Curtis himself, after the trial, acknowledged that he had been completely won to Loring's view. Many of his antislavery addresses were published.

LORING, GEORGE BAILEY (1817–91). An American agriculturist. He was born in Massachusetts, graduated at Harvard in 1838, and at the Harvard Medical School in 1842, after which for several years he was physician at the Chelsea (Mass.) marine hospital. From 1850 on, he devoted himself extensively to the study of scientific agriculture. Residing in Salem, he several times represented that city in both branches of the Legislature. He was also for many years president of the Massachusetts Agricultural Society, was a member of the Republican National Convention in 1868 and 1872, and enjoyed a high reputation as a public speaker. He was a member of Congress from the Essex District in 1877–81, United States Commissioner of Agriculture in 1881–85, and Minister to Portugal in 1889–90. His writings include several public addresses, and *The Farm-Yard Club of Jotham* (1876).

LORING, WILLIAM WING (1818–86). An American soldier, born at Wilmington, N. C. He was early taken by his parents to Florida and at the age of 14 enlisted in a volunteer company which took part in the Seminole War, attaining the rank of lieutenant in 1837. Later he studied for a time at Georgetown (D. C.) College and then served as a volunteer in the war for Texan independence. Having returned to Florida, he was a member of the Territorial Legislature from 1839 to 1842. In the latter year he was admitted to the bar. In the Mexican War he became captain in a regiment of mounted rifles and served with distinction under General Scott. He was in command of the troops in the Department of Oregon from 1849 to 1851 and served against the Indians in the Rio Grande country until 1856, when he was promoted to be colonel. In 1857–58 he served under Albert Sidney Johnston at the time of the Mormon troubles in Utah. He was strongly opposed to the secession movement, but was a believer in the doctrine of States' rights, and on the withdrawal of Florida from the Union he entered the Confederate service, in which he was at once appointed brigadier general. He became a major general in February, 1862; served with distinction in West Virginia and as a corps commander in Georgia, Mississippi, and Tennessee; took part in the Vicksburg and Atlanta campaigns, and in the battles of Franklin and Nashville, in 1864, where he was second in command to Gen. John B. Hood. Later he served under Gen. Joseph E. Johnston in the Carolinas, surrendering with him to Sherman in April, 1865. After several years in the banking business in New York City, he accepted in 1869 a commission from Ismail Pasha, the Khedive of Egypt, to reorganize his army. In 1870 he was made commandant of Alexandria and put in charge of the coast defenses of Egypt. He remained 10 years, accomplished his task with great success, and returned to America in 1879 with the rank of general of division. He published an account of his Egyptian service under the title of *A Confederate Soldier in Egypt* (New York, 1883).

LORINSER, lō-rĭn′zẽr, Karl Ignaz (1796–1853). A German physician, born at Niemes, northern Bohemia. After studying at the universities of Prague and Berlin he was appointed a lecturer in the Veterinary School at Berlin in 1818 and a member of the College of Medicine at Stettin in 1822. From 1824 to 1850 he was a medical councilor in the Prussian government service. In the study of epidemics he traveled through Hungary, Transylvania, and Galicia. His works, *Untersuchungen über die Rinderpest* (1831) and *Die Pest des Orients* (1837), deal with these investigations. His *Zum Schutz der Gesundheit in den Schulen* (1836; new ed., 1861) effected a revival of gymnastics in German schools. His autobiography appeared in 1864.

LORIQUET. See Lorikeet.

LO′RIS (probably from Dutch *loeris*, clown, from *loer*, *loerd*, fool, from OF., Fr. *lourd*, stupid, from Lat. *luridus*, wan, from *luror*, pale-yellow color; otherwise explained as the native East Indian name). Either of two genera of Asiatic lemurs forming the subfamily Lorisinæ, and differing from the true lemurs in having a round head, very long limbs, and short muzzle, very large eyes, and no tail. The two best-known species are both natives of India and the East Indies. The largest species (*Nycticebus tardigradus*, or *coucang*) is not so large as a cat, and is found in Upper Bengal and Burma; the other, the slender loris (*Loris gracilis*, or *tardigradus*) is much smaller and is found only in the lowland forests of Ceylon. They are nocturnal animals and spend the day generally sleeping, attached to a branch, which they grasp firmly with all their four hands, the body rolled up into a ball and the head hidden among the legs. Their fur is rich and soft. Their motions are slow, and they advance stealthily on the insects and birds on which they prey. They feed, however, partly on fruits and vegetables. The first-named, or "slow," loris is the object of much superstitious regard among the Malays, because of its secretive habits and weird appearance. Consult: F. E. Beddard, "Mammalia," in *Cambridge Natural History*, vol. x (London, 1902); Flower and others, in *Proceedings of the Zoological Society* (ib., 1864, 1900); D. G. Elliot, *A Review of the Primates* (New York, 1913). See Plate of Lemurs.

LORIS-MELIKOV, lō′rês mĕ′lyê-kôf, Mikhail Tarielovitch, Count (1825–88). A Russian general and statesman, born in Tiflis, Nov. 2, 1825. He was a descendant of a wealthy Armenian family and received a good education in the Lazarevski Institute of Oriental Languages and in the Military Academy for Guards. In 1843 he entered the army, won an excellent reputation in the Caucasus, and commanded a regiment during the Crimean War. In 1856 he was made a major general and in 1863 rose to be lieutenant general and was appointed Governor of the territory of Tersk. In this capacity he showed remarkable executive ability and liberal tendencies, founding schools and introducing trial by jury. In 1876 he was placed in command of the corps which was stationed on the Armenian frontier and on the declaration of war against Turkey in 1877 marched into the enemy's territory. He besieged Kars, but failed to take the city and met with a number of reverses, which compelled him to raise the siege. Receiving reënforcements, he won in October the battle of Alaja-Dagh, and in the following month took Kars. For this brilliant campaign he was made Count in 1878. In 1879 he was appointed Governor-General of six governments, with a central seat in Kharkov, and was the only Governor-General to acquire the confidence of the population. In 1880, the Nihilist movement having become alarming, he was appointed by the Czar chairman of the Imperial Administrative Commission, giving him almost dictatorial power in the Empire. He subsequently became Minister of the Interior and induced Alexander II to establish some form of representative government, a plan the execution of which was prevented by the assassination of the Czar (March 13, 1881). However, many of the reforms which he advocated, such as factory legislation for workers, taxation of inheritances, etc., were later carried out by the government. Loris-Melikov was a very courteous man, tolerant, accessible, and loyal to his principles. He remained a strict and consistent Liberal all his life and died at Nice, Dec. 12, 1888.

LORITI, lô-rē′tė, Heinrich. The original name of the Swiss humanist better known as Glareanus (q.v.).

LORMIAN, lôr′myäɴ′, Baour. See Baour Lormian, Pierre Marie François Louis.

LOR′NA DOONE. A novel by R. D. Blackmore (1869).

LORNE, John, Marquis of. See Argyll, John Douglas Sutherland Campbell, ninth Duke of.

LORNSEN, lôrn′sen, Uwe Jens (1793–1838). A Danish patriot, born at Keitum on the island of Sylt and educated in law at Kiel and at Jena (1816–20). The July revolution (q.v.) roused his old ideas of independence and patriotism, and in 1830 he published a pamphlet, *Ueber das Verfassungswerk in Schleswig-Holstein*, a strong argument and a bold plea for autonomy. He was sentenced to a year's imprisonment in May, 1831, and soon after his liberation the Danish government offered him a pension if he would leave the country. He refused the offer, but, strangely enough, possibly because of ill health, in 1833 went to Amsterdam and sailed for Rio de Janeiro. Four years later he returned to Europe and lived in France and in Switzerland. In 1838 he shot himself. He wrote: *Die Unionsverfassung Dänemarks und Schleswig-Holsteins*, which was published by Beseler in 1841. Consult Jansen, *Uwe Jens Lornsen* (Kiel, 1872; 2d ed., 1893).

LORO. See Parrot Fish.

LORRAIN, lô′răɴ′, Claude. See Gelée, Claude.

LORRAINE, lô′răn′. The name of several districts which have figured in mediæval and modern history, now the designation of a region mainly in France and partly in Germany. On the death of Lothair I (q.v.), Roman Emperor and grandson of Charles the Great, in 855, his son Lothair II inherited the region between the Rhine and the rivers Scheldt and Meuse, extending from the North Sea to the headwaters of the Saône. This country, which was erected into a kingdom, was called *Lotharii Regnum* (Kingdom of Lothair), whence Lotharingia, Lothringen, and Lorraine. It corresponded approximately to the earlier Austrasia (q.v.). In 870 the region was partitioned between Louis the German and Charles the Bald (see Charles I, the Bald), King of the West Franks, and the name Lorraine blotted out from the map. In 895 Lorraine was reëstablished by King Arnulf for his son Zwentibold, and soon after it passed to Louis the Child, King of Germany. The kings of France attempted to annex the country, but the German kings succeeded in retaining possession of it. In 959 it was divided into two duchies, Upper Lorraine and Lower Lorraine. The former centred around the Moselle, the latter around the Meuse. The two were separated by the forest of Ardennes. The most noted of the dukes of Lower Lorraine was Godfrey de Bouillon (q.v.). By the middle of the thirteenth century Lower Lorraine had come to be divided among the counts of Louvain (later dukes of Brabant), the counts of Holland, Limburg, and Luxemburg, and the bishops of Utrecht. After many vicissitudes most of it passed under the sway of the dukes of Burgundy. Upper Lorraine, which contained Metz, Toul, Verdun, Treves, Nancy, etc., was styled Lorraine in the thirteenth century, as the dukes of Lower Lorraine called themselves dukes of Brabant. The dukes of Lorraine continued to rule down to the eighteenth century. The duchy was a member of the Germanic body, but had close relations with France. In 1736 it passed to Stanislas Leszczynski, ex-King of Poland, while its last independent Duke, Francis Stephen, husband of Maria Theresa of Austria, received Tuscany in exchange. On the death of Stanislas, in 1766, it was united to France. In 1552 France had seized and annexed the bishoprics of Toul, Metz, and Verdun. The name Lorraine was applied to an administrative division which included the former Duchy of Lorraine, the Duchy of Bar, the three bishoprics of Metz, Toul, and Verdun, French Luxemburg, German Lorraine, and the Duchy of Bouillon. It was afterward subdivided into the departments of Meuse, Moselle, Meurthe, and Vosges. By the Treaty of Frankfort, May 10, 1871, France ceded to Germany portions of the departments of Moselle and Meurthe (German Lorraine and Metz). This district forms part of the Reichsland of Elsass-Lothringen. For the history of Lorraine consult: Comte d'Haussonville, *Le réunion de la Lorraine à la France* (2d ed., 4 vols., Paris, 1860); Parisot, *Le royaume de Lorraine sous les Carolingiens* (ib., 1899); LaVisse, *Histoire de France*, passim (9 vols., ib., 1900–10). In the early part of the European War which began in 1914 the French made several efforts to reoccupy the territory lost in 1871. Some of the bloodiest battles of the war were fought in the four departments of French Lorraine. See War in Europe; Alsace-Lorraine.

LORRAINE, Dukes and Cardinals of. See Guise.

LORRAINE GLASS. The name of Claude Lorraine glass is given to peculiarly tinted glass, sometimes used in opera glasses and stereoscopes, which is supposed to give to the objects viewed the coloring characteristic of the artist's works. The Lorraine mirror, sometimes used by artists, consists of a polished plate of glass ground very slightly convex on the exterior and concave on the inner side, which is coated with a surface of black composition highly polished. This is so placed as to reflect a landscape, which may be then drawn from the reduced image in the glass, the convexity of surface assisting in the perspective and distance. See Glass.

LOR′REQUER, Harry. The hero of Charles Lever's (q.v.) military novel of the same name.

LORRIS, Guillaume de. A French troubadour. See Guillaume de Lorris.

LORTZING, lôrts′ĭng, Gustav Albert (1803–51). A German operatic composer, born in Berlin. His parents were members of a traveling theatrical troupe, and the boy was practically self-taught, save for a few lessons received from a teacher in Berlin (Rungenhagen). He produced his first opera, *Ali Pascha von Janina*, in 1824, and in 1826 joined the permanent company of the Court Theatre at Detmold. His next two works were vaudevilles, *Der Pole und sein Kind* and *Scene aus Mozarts Leben*. His most successful opera is *Czar und Zimmermann* (1837), which is to this day performed in every German opera house. *Der Wildschütz* (1842) and *Der Waffenschmied* (1846) were scarcely less popular. His uneven temperament and character greatly interfered with his artistic as well as his material success. Conductor of the Leipzig Opera in 1844, he almost immediately quarreled with the management and had to resign. After a brief period, however, admirers secured his reinstatement; but a second quarrel brought his engagement to an end. In 1850 he was appointed kapellmeister of the new Friedrich Wilhelmstädtisches Theater in Berlin, where he produced some successful light operas, farces, etc. He was a prolific composer, and his music was melodic. Many of his operas are still popular on the provincial German stage. He died in Berlin. Consult Herman Wittmann, *Lortzing* (Leipzig, 1889), and G. R. Kruse, *Albert Lortzing* (Berlin, 1899).

LORY, lō′rĭ (Malay, Hind. *lūrī′ nūrī*). 1. Any of the small, brush-tongued, honey-eating parrots of the family Loriidæ (or Trichoglossidæ), which vary in size from that of a dove to that of a sparrow; the lesser forms are usually called lorikeets (or loriquets). The group includes about 90 species and is confined to Polynesia and Australasia excepting New Zealand. These parrots, whose most important anatomical peculiarity is the structure of the tongue, which is tipped with a bundle of bristles, have a dense soft plumage, exhibiting the most rich and mellow colors; the tail is rounded, generally not long; the bill is feebler than in many of the parrots, and the upper mandible much arched. They are very active and lively, even in confinement, and are also of very gentle and affectionate disposition. Red, green, blue, and yellow are the prevailing colors of their plumage. One of the most beautiful and interesting of the groups is the genus *Domicella*. For much curious information and an extensive bibliography, consult Newton's article "Lory," in *Dictionary of Birds* (London and New York, 1893–96). See Colored Plate of Parrots.

2. A dealer's name for the Australian parrots of the genus *Aprosmictus*, more usually called king lory.

3. In South Africa, a touraco (q.v.).

LOSADA, Manuel. See Lozada, Manuel.

LOS ANGELES, lôs äng′hâ-lâs. Capital of the Province of Bío-Bío, central Chile (Map: Chile, E 5). It is situated between the Laja and Bío-Bío rivers in a fertile district. Settled in 1739, it figured somewhat in the struggles with the Araucanian Indians. Pop., 1895, 7868; 1907. 11,691.

LOS ANGELES, lȯs ăn̲′gĕl-ĕs *or* ăn′jĕl-ĕs. The largest city of southern California, and the county seat of Los Angeles County, 475 miles by rail southeast of San Francisco, on the Los Angeles River, 20 miles from its mouth, and on the Southern Pacific, the Pacific Electric, the Atchison, Topeka, and Santa Fe and the San Pedro, Los Angeles, and Salt Lake railroads; and it is the centre of an extensive interurban railway system (Map: California, G 8). It is immediately south of the Sierra Madre Range, and its harbor, protected by a $3,000,000 breakwater, admits vessels of 20-foot draft. The city owns many miles of the harbor frontage, on the improvement of which $10,000,000 is being expended (1915).

Los Angeles, occupying an area of 287.9 square miles, is renowned for its beauty and for the healthfulness of its mild, equable climate. Its broad avenues are embowered in luxuriant foliage, and the adjacent orange groves and fine fruit gardens present a marked contrast to the barren coasts of the vast unirrigated region thereabouts. In the vicinity are other places celebrated as pleasure, health, and seaside resorts—notably, Venice, Long Beach, Ocean Park, San Pedro, Huntington Beach, Newport Bay, Balboa, Redondo Beach, Santa Monica, and Santa Catalina Island. The city is the seat of a State normal school, St. Vincent's College (Roman Catholic, opened in 1865), University of Southern California (Methodist Episcopal, opened in 1880), and Occidental College (Presbyterian, opened in 1887). The public-school system is excellent, the schools having an enrollment of 80,000 pupils and 2800 teachers. Among the prominent buildings are the Bible Institute (erected at a cost of $1,400,000), State Agricultural College, armory, State exposition building, the city hall, county courthouse, Federal building, Hall of Records, city auditorium, Shrine auditorium, Roman Catholic cathedral, and the Blanchard Art Building. Also of interest are the Old Plaza Church, the headquarters of General Frémont, the viaduct of the electric streetcar road over the railroad tracks in the eastern part of the city, the district known as Chinatown, large alligator and ostrich farms, and Sonora Town. There are public libraries containing an aggregate of 250,000 volumes, several hospitals, and asylums, beautiful cemeteries, a crematory, and magnificent botanical gardens and parks—notably Elysian, Westlake, Eastlake, Echo, Hollenbeck, Griffith, Central, and Plaza parks. More than 4000 acres in parks, particularly attractive on account of their semitropical foliage, are accessible to the public; of these fully 3000 acres are outside the city limits. This is essentially a city of homes, owned for the most part by those who occupy them. There are more than 20 banks, the total clearings of which in 1913 amounted to $1,211,000,000, and building operations are proceeding at the rate of about $18,000,000 annually.

Los Angeles has important fruit-growing and shipping interests and is an extensive winemaking place. Oranges and lemons, walnuts, live stock, and oils are by far the leading exports, but there is a large trade also in cereals and garden stuff. The city is the mining centre for southern California and Arizona, the surrounding region having valuable deposits of gold, silver, iron ore, copper, lead, and zinc, and producing asphalt and petroleum. The refining of petroleum is an important industry in Los Angeles, while other industrial establishments include foundries and machine shops, abattoirs and meat-packing plants, railroad shops, publishing houses, breweries, creameries, etc., the total value of their products amounting to about $175,000,000 annually.

The government is vested in a mayor biennially elected, a unicameral council of nine members, and a number of commissions appointed by the mayor with the consent of the council. The public library is in charge of five trustees appointed by the executive; the police, fire, park, and health departments are each in the hands of four commissioners elected by the council, the mayor being ex-officio member of these bodies and chairman; the department of education is under the control of a board of seven members, elected at large. The city spent in 1914 in maintenance and operation $6,000,000, the main items of expense being about $3,706,000 for schools, $749,000 for the police department, $601,000 for the fire department, $383,000 for street cleaning, $141,000 for parks, and $421,000 for municipal lighting. Los Angeles is supplied with water by an aqueduct 235 miles in length. It was built by the city (i.e., practically without contractors) and cost about $23,000,000. The project is designed to furnish large quantities of mechanical energy and to supply water for irrigation purposes. See AQUEDUCT.

Los Angeles was settled by the Spaniards as Puebla de Nuestra Senora la Reina de los Angeles (City of Our Lady, the Queen of the Angels) in 1781, and until 1847 alternated with Monterey as the seat of government for the Mexican Province of California. In 1846 it was taken by Commodore Stockton, U. S. N., after slight opposition. In 1851 it was chartered as a city. The increase in the city's population has been exceedingly rapid. In 1850 the population was 1610; 1860, 4385; 1870, 5728; 1880, 11,183; 1890, 50,395; 1900, 102,479; 1910, 319,198; including 60,000 foreign born and 7000 negroes; 1914 (U. S. est.), 438,914; 1920, 576,673.

LOSAN′TIVILLE. A name originally selected for the present city of Cincinnati, intended to mean the 'town opposite the mouth of the Licking.' The word is made up of the initial letter of Licking, the Latin *os*, mouth, *anti-*, opposite, and *ville*. In 1790 the name was changed to Cincinnati.

LOSERTH, lō′zĕrt, JOHANN (1846–). An Austrian historian, born at Fulnek, Moravia. He was educated at Vienna and became professor in a secondary school there in 1871, in the University of Czernowitz in 1875, and in the University of Graz in 1893. Loserth's most important studies were in the history of the early Reformation and of the Counter Reformation. Besides his *Beiträge zur Geschichte der husitischen Bewegung* (1878–95) and a volume on *Huss und Wyclif* (1884; Eng. trans., 1884, by M. J. Evans), Loserth edited for the Wiclif Society, Wiclif's writings: *De Ecclesia* (1886), *Sermones* (4 vols., 1887–89), *De Eucharista* (1892), *Opus Evangelicum* (4 vols., 1895–96), *De Potestate Papæ* (1907), and the *Letters* (1911). Among his other works mention should be made of *Hubmaier* (1893); *Kommunismus der mährischen Wiedertäufer im 16. Jahrhundert* (1894); *Studien zur Kirchenpolitik Englands im 14. Jahrhundert* (1897–1907); *Reformation und Gegenreformation in dem innerösterreichischen*

Ländern (1898); *Geschichte des späteren Mittelalters* (1903).

LOS HERREROS, lôs â-rā′rôs. See Bretón de los Herreros.

LOSKIEL, lôs-kēl′, George Henry (1740–1814). A Moravian bishop. He was born at Angermuende, Courland, Russia; was educated at the Moravian College and Theological School in Germany; was consecrated to the episcopal office in 1802 and appointed presiding Bishop of the northern district of the American province. He resigned that position in 1811 and was appointed a member of the chief executive board of the Moravian church at Bertelsdorf, Saxony; but his health had failed, and he was not able to leave the United States. He was author of a book of meditations for every day in the year, entitled *Etwas fürs Herz* (1806), which is still in high repute; and of a *Geschichte der Mission der evangelischen Brüder unter den Indianern von Nordamerika,* the materials for which were derived from the accounts of Gottlieb Spangenburg and David Zeisburger (1789; Eng. trans., 1794). Consult his *Life and Letters,* edited by Schweinitz (Philadelphia, 1871).

LOSS (AS. *los,* from *for-lēosan,* Goth. *fralinsan,* OHG. *for-liosan,* Ger. *verlieren,* to lose; connected with Lat. *luere,* Gk. *λύειν, lyein,* to loose). In its legal sense, the deprivation of some right or thing, which the law recognizes as having value, against the will of the person entitled to its possession. It may apply to property, as the loss of goods, or to a more intangible right, as loss of good repute or professional reputation. The term implies, in law, that the person thus unwillingly deprived of the right or thing is still entitled to its possession or enjoyment. For example, where a watch is said to be lost, the implication is that it has gone out of the possession of the owner without his consent and knowledge, and that he still owns it. It is, therefore, the direct opposite of conveyance or transfer, which import a conscious act of the will.

The word is employed in a somewhat technical sense in insurance law, to denote the damage suffered by the party insured upon the happening of the casualty insured against. See the article Insurance.

LOS SEISES, lōs sā′ê-sâs. This name, meaning literally "The Sixes," is given to the boys, in reality 10 in number, who on Corpus Christi, during the three days of Carnival and the Octave of the Immaculate Conception, perform a ritual dance before the high altar in the cathedral of Seville. The origin of this dance is unknown, but a reference to it in a papal bull of 1439 shows its existence prior to that date. It is given at vesper time before the Holy Sacrament, and is witnessed by the Cardinal Archbishop and clergy. It is slow and stately. The dancers face one another in two lines of five each, and perform their evolutions playing upon castanets and singing. The quaint costume is red and white for the feasts of Corpus Christi and the Carnival, and blue and white for the Immaculate Conception. A plumed hat is worn during the entire dance. Consult *Los españoles pintados por sí mismos* (Madrid, 1843) and E. B. O'Reilly, *Heroic Spain* (New York, 1910).

LOS′SING, Benson John (1813–91). An American popular historian, born in Beekman, N. Y. He began active life as a journalist, publisher, and engraver. He prepared the *Pictorial Field Book of the Revolution* (1850–52) and *The Hudson from the Wilderness to the Sea* (1866). A natural sequel to the former book was *Pictorial Field Book of the Civil War* (1866–69), followed by *Pictorial Field Book of the War of 1812* (1868). Investigations connected with the preparation of these works led to many historical studies, of which the chief are: *The Life and Times of Philip Schuyler* (1860; rev., 1880); a series of school histories; a large history of the United States; *Our Country* (1873); *The American Centenary* (1876); *Story of the United States Navy for Boys* (1880); *Cyclopædia of United States History* (1881); *History of New York City* (1884), followed by *The Empire State* (1887).

LOSSINI, lôs-sē′nê. An island in the Adriatic Sea. See Lussin.

LOST CAUSE. A term used of the Southern issues at stake in the Civil War, State sovereignty and the institution of slavery. It owes its origin to E. A. Pollard's history of the war bearing that title (1866).

LOST CHORD. A short poem by Adelaide A. Procter, which appeared in *Household Words,* and again in *Legends and Lyrics,* a collection of her poems, in 1858. It was set to music by Sir Arthur Sullivan.

LOST PLE′IAD, The. 1. One of the seven stars composing the constellation into which the Pleiades (q.v.) were changed, and of which only six are visible. The missing star was explained as Merope, who concealed herself in shame at having married a mortal (see Merope, 2), or as Electra, one of the Pleiades, mother by Zeus of Dardanus (q.v.), who abandoned her place in order that she might not witness the overthrow of Troy, or as Sterope, another of the Pleiades, who hid as Merope hid, and for the same reason. 2. A poem by Letitia E. Landon (1829). 3. A well-known painting by T. B. Read.

LOST PROPERTY. Chattels which have passed out of the possession of the owner or other person entitled thereto, not by his will or consent and not by the tortious taking of another. It thus includes chattels casually lost or mislaid in a public place or on the premises of another, as well as a ship or cargo lost at sea. Originally the term did not cover a wreck, i.e., a ship or goods cast ashore in a storm, nor goods thrown away by a thief in his flight, but these may now properly be described as lost. (See Wreck; Waif.) Goods lost are still the property of the loser and may be recovered by him from the finder. See Finding.

LOST RIVER. A river in Hardy Co., W. Va., which in part of its course disappears underground (Map: West Virginia, F 2).

LOST TRIBES OF ISRAEL. See Babylonian Exile; Jews.

LOT, lôt. A southwest department of France, formerly part of the Province of Guienne (Map: France, S., F 4). Area, 2018 square miles. It is watered by the Dordogne and the Lot, with its tributary, the Sellé. A range of hills, broad, but attaining an altitude of only 2500 feet, and containing some iron, runs through the centre of the department from east to west in the form of a semicircle. The soil is mainly of limestone foundation; and the valleys yield corn, hemp, tobacco, and fruits. Wine is the chief staple of industry, that of Cahors being especially well known. Flax mills are numerous. Capital, Cahors (q.v.). Pop., 1891, 253,939; 1901, 226,720; 1911, 205,769.

LOT (Lat. *Oltis*). A river of south France, one of the largest tributaries of the Garonne (Map: France, S., G 4). It rises in the Cévennes at an altitude of nearly 5000 feet and flows in a westerly direction through the departments of Lozère, Aveyron, Lot, and Lot-et-Garonne, joining the Garonne at Aiguillon, after a winding course of 300 miles. It has been canalized between Bouguiés, the head of navigation, and the Garonne, a distance of 160 miles.

LOT, lŏt. According to the Book of Genesis, the son of Haran and nephew of Abraham, and, through his daughters, ancestor of the Moabites and Ammonites. He is said to have emigrated with Terah and Abraham from Ur of the Chaldees to Haran, and with the latter to Canaan (Gen. xi. 27–xii. 5). There Abraham and Lot separated, and Lot chose to dwell in the "circle of the Jordan," i.e., the plain between Jericho and Zoar, near the Dead Sea; he made his abode in Sodom (xiii. 5–12). He was captured in a raid upon Sodom and rescued by Abraham (chap. xiv). Dwelling in Sodom, he is brought into connection with the destruction of the city, which is described with many details (xix. 1–29). Lot is often mentioned in the Koran and is regarded as a teacher of righteousness (e.g., sura vii. 78–82; xxvi. 160–174), and the Arabs still call the Dead Sea *Bahr Lut*, or Sea of Lot. Many modern scholars regard the narrative of Lot as a combination of tribal traditions with legendary and perhaps mythical admixtures. As the nephew of Abraham, he is thought to represent a minor clan, once in close affiliation with a Hebrew clan and afterward separated from it. The separation cannot well have been an amicable one, for otherwise tradition would hardly have represented Lot as the ancestor of two tribes so hateful to Hebrews as Moabites and Ammonites. The rescue by Abraham, if it has any historical basis, belongs to the period when the relations were still friendly. The story of Lot's incest with his daughters reminds of passages in early Arabic poetry, where it is often sought to bring a rival (or a hostile clan) into disrepute by casting suspicion upon his descent. The destruction of Sodom and Gomorrah is also paralleled by various tales circulated among the Arabs. It is not impossible that Lot is identical with Lotan, the eponym of a Horite clan (Gen. xxxvi. 20, 22, 29). The sojourn of Lot in a cave (Heb. *hor*, cave) would then find a natural explanation. See Sodom and Gomorrah.

LOT. 1. The King of Norway, husband of King Arthur's sister Anne, and father of Walgan and Modred, in *Geoffrey of Monmouth*. 2. The King of Orkney, in Malory's *Morte d'Arthur*. He is the husband of Margawse, King Arthur's sister, and the father of Gawain, Agravain, Gaheris, and Gareth. In Tennyson's *Crowning of Arthur* his wife is Bellicent.

LOTBINIÈRE. See Joly de Lotbinière.

LOT-ET-GARONNE, lō′tȧ-gȧ′rŏn′. A southwest department of France, formerly part of the provinces of Guienne and Gascony (Map: France, S., E 4). Area, 2079 square miles. The department is level, except in the south, where spurs of the Pyrenees make their appearance, and extremely fertile in the basins of the Garonne and Lot, its chief rivers; the east is chiefly composed of barren limestone plateaus known as "causses," and the southwest of sandy and marshy *landes*. The chief mineral is iron. The principal products are corn, wine, hemp, fruits, tobacco, anise, coriander, cork, swine, and cattle. Poultry is reared for exportation. Capital, Agen. Pop., 1891, 295,360; 1901, 278,740; 1911, 268,083, among whom are a considerable number of French Protestants.

LOTHAIR (lô-thâr′) **I** (c.795–855). A Frankish ruler, Roman Emperor from 840 to 855. He was the eldest son of Louis the Pious (q.v.). He was associated with his father in the Empire in 817 and was crowned by the Pope in 823. After the partitions of 829 and 831 he and his brothers revolted against their father, who was deposed in 833. But in 835 Louis again assumed the government, and Lothair received as his portion merely the Kingdom of Italy, which he ruled until by the division of 839 he received the eastern part of the Empire in addition to Italy. After the death of Louis the Pious, Lothair attempted to assert his power, as overlord, over his brothers, but was conquered at Fontenoy, or Fontanet, June 25, 841. By the Treaty of Verdun, in 843, the title of Emperor was guaranteed to him, together with the sovereignty over Italy, a long strip of territory between the Rhine and the rivers Scheldt and Meuse, and the region between the Rhone and the Alps. His later years contain little worthy of note. He died Sept. 28, 855, after having divided his kingdom among his three sons and having assumed for himself the monastic garb. Consult Dümmler, *Geschichte des ostfränkischen Reiches*, vol. i (2d ed., Leipzig, 1887), and Ernest Lavisse, *Histoire de France*, vol. ii, part i (Paris, 1903).

LOTHAIR II (?–869). A Frankish ruler, proclaimed King in 855 by the nobles of Lorraine on the death of his father, Lothair I. He is best known on account of his attempt to divorce his wife, Teutberga, in order to marry his concubine, Walddrada. Pope Nicholas I (858–867) interfered, and deposed the archbishops of Treves and Cologne, who had granted a divorce to Lothair. Lothair finally had to yield. Consult Dümmler, *Geschichte des ostfränkischen Reiches* (2d ed., 3 vols., Leipzig, 1887–88). See Nicholas I.

LOTHAIR III (II), the Saxon (c.1060–1137). German Emperor from 1125 to 1137, Count of Supplinburg and Duke of the Saxons. He was the third King of the name, but the second Emperor, hence the variation in the numbering. Through his wife, Richenza, he had secured large possessions in Saxony, and in 1106, as a reward of his services to Henry V, he received the Saxon duchy. He soon revolted against Henry and was in hostile relations with him during most of his reign. At the death of Henry, Lothair was elected Emperor by the opponents of Frederick, Duke of Swabia, of the house of Hohenstaufen. He gave his daughter and heiress, Gertrude, in marriage to Henry the Proud, Duke of Bavaria, and invested that prince with the Duchy of Saxony. Henceforth there was a great struggle for ascendancy between the powerful houses of Guelph and Hohenstaufen. The Hohenstaufen revolted against Lothair, and submitted to him only after several years of war. Lothair also was successful in extending German influence on the east and north, asserting the Imperial power against Slavs and Danes. He made two expeditions into Italy, and died on Dec. 4, 1137, while returning from that country. Consult Jaffé, *Geschichte des deutschen Reichs unter Lothar dem Sachsen* (Berlin, 1843), and Bernhardi, *Jahrbücher des* *deutschen Reichs unter Lothar von Supplinburg* (Leipzig, 1879).

LOTHAIRE, lŏ-thâr′ (941–986). A Frankish king. He succeeded his father, Louis d'Outremer (IV) in 954. He was engaged in struggles with his great vassals, especially Richard, Duke of Normandy, and Hugh Capet, and was unable to uphold the royal authority. In 978 he set out to conquer Lorraine, and attempted to surprise and capture the Emperor Otho II at Aix-la-Chapelle. He failed, and the enemy advanced to the walls of Paris. Although they were forced to retreat, Lothaire was compelled to give up his claims to Lorraine. In 983 he made a second attempt to conquer that country. He had succeeded in taking the stronghold of Verdun when he died.

LO′THARIN′GIA. See LORRAINE.

LOTHA′RIO. 1. In Rowe's *Fair Penitent,* a young nobleman of Genoa, who seduces Calista, the wife of Altamont, and is killed in a duel by the latter. He is the type of the libertine. 2. A character in Cervantes' *Novela del curioso impertinente,* who is persuaded by Anselmo to test the virtue of Anselmo's wife. Lothario does as his friend bids him, but with disastrous results. This story is told in *Don Quixote.*

LO′THIANS, THE. The counties of Haddington, Edinburgh, and Linlithgow, Scotland, respectively known as East Lothian, Mid-Lothian, and West Lothian. The name was anciently applied to the whole territory between the rivers Tweed and Forth, which from 547 to 1018 formed a part of Berenicia or Northumbria.

LO′THROP, AMY. A pseudonym of Anna Bartlett Warner (q.v.).

LOTHROP, HARRIETT MULFORD (STONE) (1844–). An American author, born in New Haven, Conn. She married Daniel Lothrop, the Boston publisher, in 1881. She was the founder of, and successively the president and honorary president of, the Society of the Children of the American Revolution. Her children's books, written under the pen name of Margaret Sidney, have had a considerable and continued success. Especially is this true of her series of stories about "The Five Little Peppers," which have much the same kind of charm as Miss Alcott's books. Of these 10 or more appeared between 1883 and 1907. Other books, among many, include: *The Pettibone Name* (1883); *What the Seven Did* (1883); *The Minute-Man* (1886); *Dilly and the Captain* (1887); *A Little Maid of Boston Town* (1910). Her *Works* in 12 volumes were published in Philadelphia in 1914. She constantly contributed poems and articles to the leading juvenile publications.

LOTHROP, JOHN. See LATHROP, JOHN.

LOTI, lŏ′tē′, PIERRE (1850–). A name assumed by Louis Marie Julien Viaud. A French novelist and naval officer, of Huguenot ancestry, born at Rochefort, Jan. 14, 1850. He entered the marine service in 1867 and traveled extensively, resigning his naval office in 1898 with the rank of lieutenant. Twelve years intervened between his first cruise and *Aziyadé* (1879), his first novel. Loti has an extraordinary power of impressionistic description and a curious way of suggesting a vague melancholy. To every landscape he gives an individuality. Environment with him seems not only to explain but to condition character. He chooses always strange scenes—Constantinople in *Aziyadé,* Tahiti in *Rarahu* (1880; reprinted as *Le Mariage de Loti,* 1882), Senegal in *Le roman d'un spahi* (1881), Brittany and a man-of-war in *Mon frère Yves* (1883), the fishing fleet in *Le pêcheur d'Islande* (1886), Algeria in *Le Kasbah* (1884), Japan in *Madame Chrysanthème* (1887), the Basque country in *Ramuntcho* (1897). Often he gives impressionist pictures with no thread of narrative, as in *Au Maroc* (1890), *Le désert* (1895), and *Galilée* (1895). His later work comprises *Les derniers jours de Pékin* (1901); *L'Inde (sous les Anglais)* (1903); *Vers Ispahan* and *Judith Renaudin* (1904); *La troisième jeunesse de Madame Prune* (1905); *Les désenchantées* (1906); *La mort de Philæ* (1908); *Le pélerin d'Angkor* (1912). In 1913 his *Daughter of Heaven,* written in collaboration with Judith Gautier, was presented in New York elaborately but with slight success. *On Life's By-Ways* appeared in 1914. In 1904 he translated *King Lear* in collaboration with Emile Vedel. Loti's stories are little more than log books of sentiments, of which the strongest is a shrinking from excessive culture, "from modern sham, false luxury, uniformity, and imbeciles." It is the primitive that attracts him in civilization, scene, race, and character. Intensity of passion, resignation, a universal pity, are the abiding moral characteristics of his work, most intensely expressed in *Le livre de la pitié et de la mort* (1891) and *Figures et choses qui passent* (1897). In making prose the vehicle of sensation, Loti has surpassed Flaubert and the Goncourts. The virtuosity of his impressionism lies in its very simplicity. It gives no defined picture, but a very intense impression of a new mode of thought and feeling, of exotic ethics and strange manners. Loti was elected to the Academy in 1891, and the usual academic edition of his *Works* was begun in 1893. For critical essays, consult: Jules Lemaître, *Contemporains,* vol. iii (Paris, 1888); Henry James, *Essays in London and Elsewhere* (New York, 1893); Doumic, *Ecrivains d'aujourd'hui* (ib., 1894); Paul Bourget, *Etudes et Portrdits* (ib., 1906); Henry Bordeaux, *Quelques portraits d'hommes* (2d ed., ib., 1913); Winifred Stephens, *French Novelists of To-Day* (2 vols., New York, 1914).

LOTICHIUS, lŏ-tĭk′ĭ-ụs, PETRUS, SECUNDUS (1528–60). A German humanist, born at Schlüchtern. He was educated in the school of the abbey of Schlüchtern and studied medicine at Marburg and classical literature at Wittenberg under Melanchthon. In 1557 he was made professor of medicine at Heidelberg. His Latin poetry was highly praised by his contemporaries; it was modeled after Ovid and Vergil, and was for the most part pagan in tone, but treated biblical themes occasionally. The best edition of his *Elegiarum Liber et Carminum Libellus* (1551) is by the younger Burmann (1754), and was translated into German by Köstlin (1826). Consult the novel *Der Professor von Heidelberg,* by Otto Müller (1870), and the biography by Ebrard, *Peter Lotich der jüngere* (Gütersloh, 1883). His nephew, JOHANN PETER LOTICH (1598–1669), was an historian and a Latin poet.

LOTION (Lat. *lotio,* a washing, from *lavare,* Gk. λούειν, *louein,* to wash), or WASH. A nonoily solution or mixture of medicinal agents, intended for external application upon limited areas of the body. Lotions usually consist of a soluble astringent salt, dissolved in water, with perhaps some glycerin or alcohol added. Among anodyne lotions are combinations of lead water and opium; the "black wash" (a mixture of a dram of calomel to a pint of lime water) is very serviceable for ulcers and unclean wounds, especially those of venereal origin. A similar preparation is "yellow wash," which consists of bichloride of mercury dissolved in lime water. Among stimulating lotions is a solution of sal ammoniac in water or in vinegar with or without the addition of alcohol; it is serviceable where there is no wound of the skin, as for rheumatism, neuralgia, etc. Antiseptic lotions contain bichloride of mercury, or carbolic acid, or boracic acid, etc. A *fomentation* is a lotion used hot. A *collyrium* is an eyewash, and generally contains a soluble astringent salt, such as subacetate of lead, or sulphate of zinc, or nitrate of silver, dissolved in rose water or distilled water.

LOTOPH′AGI. See LOTUS-EATERS.

LOT′TA. The stage name of Charlotte Crabtree (q.v.).

LOTTER, lŏt′tẽr. A family of German printers, intimately connected with the Reformation. The founder of the family was MELCHIOR LOTTER, the elder, born at Aue, and well known at Leipzig as early as 1491. He published missals, breviaries, a *Persius* (1512), *Horatii Epistolæ* (1522), and *Luther Tessaradecos Consolatoria pro Laborantibus* (1520). His relations with the Reformation are not perfectly clear, but he seems to have been a secret sympathizer. An innovation by the elder Lotter was his use of Roman letters for Latin, reserving the Gothic types for German. His son was also named MELCHIOR (?–c.1542), which has resulted in some bibliographical confusion. Melchior, the younger, is best known for printing Luther's Bible, *Das neue Testament* (1522), and the impressions of 1523 and 1524 of the Old Testament, which was transferred afterward to Lufft (q.v.). He published many other German writings of Luther. Only a little less important was his bringing a Greek font to Wittenberg, thus giving Melanchthon the means to carry on classes in Greek. When he returned in Leipzig, about 1525, Lotter carried on his father's business. Consult article by J. Franck in *Allgemeine deutsche Biographie*, vol. xix (Leipzig, 1884).

LOT′TERY (Fr. *loterie*, from *lot*, lot, from ML. *lottum*, lot, from MLG. *lot*, Goth. *hlauts*, OHG. *hlōz*, *lōz*, Ger. *Los*, AS. *hlot*, Eng. *lot*). In principle, a game of chance wherein a large number of persons unite to create a fund out of which prizes, greatly exceeding in value any individual contribution, are assigned by lot to a small number of participants. The earliest lottery of which authoritative record exists took place at Bruges in 1446. In 1530 a lottery with money prizes is recorded at Florence; and before the end of the sixteenth century it appears that lotteries were very common throughout Italy. In 1569 a lottery was held in England. This lottery was under the patronage of Queen Elizabeth, and much official pressure was brought to bear to secure subscriptions. In 1612 a lottery was granted for the benefit of the Colony of Virginia; and in 1627 a license was given to raise by a lottery money to build an aqueduct from Hoddesdon to London. Throughout the seventeenth century lotteries became increasingly frequent both in England and on the continent of Europe, and in the eighteenth century all Europe succumbed to a veritable lottery mania. The states nearly everywhere established a public monopoly of the business, sometimes managing them on public account, sometimes farming them to private individuals. The practice was soon adopted in the American Colonies. In 1720 we find notice of a lottery in Philadelphia, the prize being a new brick house, for which 350 tickets at 20 shillings each were to be drawn. Soon after lotteries became common in Pennsylvania, and in 1729 the Legislature prohibited them, but the law appears to have remained a dead letter. Many of these early lotteries were organized for public objects—the paving of streets, the construction of wharves, and the like. Lotteries for the erection of churches and educational buildings became common in most of the Colonies after the middle of the century. In 1750 a lottery was organized to raise an edifice for Yale College; Harvard raised funds in a similar way in 1772 and again in 1806. The difficulty in raising funds for public purposes led to the great extension of lotteries in the Colonial period, and even after the Revolution they were frequently employed.

In the early part of the nineteenth century the mischievous influence of lotteries came to be generally recognized. In 1826 they were prohibited in England; in 1832, in France; in 1830, in Belgium; in 1841, in Sweden. In the American States opposition to lotteries rapidly developed, and in 1833 they were prohibited by New York and Massachusetts, and by most of the other States in the two following decades. The last stronghold of the lottery was Louisiana. The Louisiana State Lottery, which received a charter for 25 years in 1868, had a monopoly of the business within the State and was required to pay the sum of $40,000 a year into the State treasury. In 1890 the company made great efforts to secure a renewal of its charter, offering finally an annual payment of $1,250,000 for it; but the act rechartering the company was vetoed by the Governor. By an Act of Congress of 1890 the transmission through the mails of lottery advertisements, or of registered letters addressed to lotteries or their agents, was prohibited. By an Act of Congress, 1894, the importation of lottery tickets or advertisements into the United States was forbidden. In 1899 the operation of lotteries in Alaska was prohibited; in 1900 the operation of a lottery or the sale of lottery tickets in Hawaii was forbidden; in 1902 lotteries, raffles, and gift enterprises were forbidden in Porto Rico. State courts have in some instances extended the definition of lottery to include prize candy boxes and nickel-in-the-slot machines in which prizes may be won (Texas and Louisiana), prize coupon packages (Kentucky), raffles (Massachusetts). Lotteries of one kind or another, generally managed on state account, still exist in most of the countries of Europe and yield a very considerable revenue. They are generally admitted to exercise a very baneful influence, encouraging recklessness and unthrift, especially in the lower classes of society.

Bibliography. For a discussion of the various principles upon which lotteries are organized, consult Palgrave, "Lotteries," in *Dictionary of Political Economy* (London, 1896); for a good discussion of the social and economic effects of the lottery, Lasson, *Lotterie und Volkswirtschaft* (Berlin, 1894). An excellent account of English lotteries will be found in J. Ashton, *History of English Lotteries* (London, 1893). The best short history of lotteries in America is by A. R. Spofford, "Lotteries in American History," in *Annual Report of the American Historical Association* (Washington, 1892); A. F. Ross, "History of Lotteries in New York," in *Magazine of History, with Notes and Queries*, vol. v (New York, 1907); *Report of Joint Select Committee on Lotteries, etc., to British Parliament* (London, 1908); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. ii (New York, 1914).

LOTTI, lôt′tê, ANTONIO (c.1667–1740). An Italian composer, born probably in Venice. His father had been court kapellmeister at Hanover, and the boy early began to study music. He completed his musical education under Legrenzi and by his seventeenth year had produced an opera, *Il Giustino*. In 1687 he became a chorister at St. Mark's, in 1690 assistant organist, in 1704 chief organist, and in 1736 he obtained the much-coveted post of maestro. On the invitation of the Elector of Saxony, Lotti spent two years (1717–19) at Dresden. At first almost entirely an operatic composer, he devoted himself after his return from Dresden entirely to sacred music. He affected the severe contrapuntal style, but softened it by a more modern use of harmonic devices; while in his Church music he avoided orchestral accompaniments in order to retain unhampered the original melodies. In addition to being a skillful composer, Lotti was a popular and capable teacher. He composed four oratorios and 20 operas, which were, however, of but ephemeral interest. His most famous works are his misereres, masses, and motets. He died in Venice.

LOT′TO (It., lot). A game of chance, played on boards divided into 27 squares arranged in three horizontal rows. Five squares in each horizontal row are marked with numbers between 1 and 90, four squares being left blank. The first vertical row contains units, the second tens, etc. The game may be played by any number of persons, each of whom is provided with a board, on which he covers the space marked with the number corresponding to that of a counter drawn from a bag and called out by a dealer. The winner is the player who first covers all the five numbers on any horizontal row.

LOTTO, lôt′tô, LORENZO (1480–c.1556). A Venetian painter of the Renaissance. He was born in Venice, studied under Alvise Vivarini, and was also influenced in his earlier works by Jacopo dei Barbari and Cima da Conegliano. During the early period of his work, which shows the influence of these and other masters, he was active at Treviso, Recanati, and Rome, where he assisted in frescoing the Vatican. From 1518 to 1528 he resided at Bergamo, where he developed an independent style, characterized by a gray color scheme with blue notes, by agitated movement, and by striking light-and-shade effects. From 1529 to 1550 he was in Venice and the immediate vicinity, where his art was modified by the increasing influence of Titian, especially in color. His finest works were executed at this time, during what Berenson calls his middle period, 1529–40. The last years of his life were spent at Ancona (1550–52) and in Loreto, where he became a lay member of the brotherhood of the famous sanctuary, to which he devoted his talents and his possessions. He was much affected by the religious revival which at that time agitated Italy as a reaction against the paganism of the Renaissance. His art shows an extraordinarily sensitive and deep psychological insight. It is this latter quality which makes his portraits more modern than those of any of his contemporaries. His last pictures were of uneven merit, but the best show the most modern treatment of paint achieved by any Italian of the Renaissance, sometimes even reminding one of the Impressionists. The art of his Bergamask period is especially well represented in Bergamo, particularly in San Bartolommeo and in the Carrara Gallery, which contains numerous examples. The Brera Gallery, Milan, contains some admirable portraits, particularly one of an old man and another of a young lady, besides religious pieces; he is also represented in other Milanese collections. Other pictures, chiefly religious pieces, are at Jesi, Ancona, Recanati, Treviso, Venice (Carmine), in various Roman galleries, especially the Capitol, which has a fine portrait of a man, and at Loreto, which possesses many of his last paintings, prominent among which is the very modern "Presentation of the Virgin in the Temple." Among important works by him in other galleries are the portrait of an architect and others in Berlin; of Prothonotary Giuliano, National Gallery, London; three religious pictures in the Louvre, several at Vienna, and one in the Metropolitan Museum, New York. Consult Bernhard Berenson, *Lorenzo Lotto: An Essay in Constructive Art Criticism* (New York, 1895), and *Masters in Art*, vol. v, part lii (Boston, 1904).

LO′TUS. A genus of plants of the natural order Leguminosæ. See TREFOIL, BIRD'S-FOOT.

LOTUS (Lat. *lotus*, from Gk. λωτός). The name given by the Greeks to a number of different plants whose fruit was used for food. One of the most notable of these is the *Zizyphus lotus*, a native of the north of Africa and the south of Europe, belonging to the family Rhamnaceæ. (See JUJUBE.) The fruit of the *Diospyros lotus*,

EGYPTIAN LOTUS.

or date plum, was sometimes called the lotus. The name "lotus" was also given to several beautiful species of water lily (q.v.), especially to the blue water lily (*Nymphæa cœrulea*), the Egyptian water lily (*Nymphæa lotus*), and to the nelumbo (*Nelumbo speciosa*) (q.v.), which grow in stagnant and slowly running water in the south of Asia and north of Africa. The *Nymphæa lotus* grows in the Nile and adjacent rivulets and has a large white flower. The root is eaten by the people who live near Lake Menzaleh. It was the favorite flower of ancient Egypt and is still often seen made into wreaths or garlands, placed on the foreheads of women or held in their hands, and smelled for its fragrance. It frequently appears in the hieroglyphs, where it represents the upper country or southern Egypt, and entered largely into works of art. In mythology it was the special emblem of Nefer Atum, the son of Ptah and Bast; the god Harpocrates is seated upon it; and there was a mystical lotus of the sun. In the mythology of the Hindus and Chinese the *Nelumbo lotus*, or *Nelumbo nucifera*, plays a distinguished part, being called the sacred bean. The Hindu deities of the different sects are often represented seated on a throne of its shape or on the expanded flower. It symbolized the world; the *meru*, or residence of the gods; and female beauty. Among the Chinese the lotus had a similar reputation and poetic meaning, being especially connected with Fuh, or Buddha, and symbolizing female beauty, the small feet of their women being called kin loĕn (golden lilies). In the United States the name "lotus" is often applied to the yellow water lily or water chinquapin (*Nelumbo lutea*). Lotus is also the generic name for a genus of leguminous plants, of which there are about 90 species. They have leaves with three leaflets and red, yellow, or white flowers. One of the best known is bird's-foot clover (*Lotus corniculatus*). It grows on light sandy soils where hardly any other plant will thrive and is much liked by stock. It is commonly grown in Europe and in the United States, especially at the South. In Europe *Celtis australis*, the hackberry (q.v), is called lotus. See Colored Plate of Aquatic Plants.

LOTUS, in Ornament. The lotus has played a more important part in ornament than any other plant or flower unless it be the acanthus (q.v.). It was the parent motive of a large part of all Egyptian decoration, and W. H. Goodyear, in his *Grammar of the Lotus* (London, 1891), has even claimed for it the parentage of the greater part of all historic ornament. This claim has been pronounced extravagant by nearly all other authorities, however, and appears to rest largely upon an unwarranted confounding, with the lotus, of many Egyptian ornament forms derived from the papyrus and other plants and flowers. It is in any case undeniable that the lotus, both as bud and blossom, appears with extraordinary frequency in Egyptian borders and all-over patterns; that the "trilobe" form, which appears in Assyrian and Persian art and is the parent of many classic details, is a conventional variant of the lotus; it is possible that many rosette ornaments may be derived from the open lotus seen in plan; and there can be little question that the anthemion and the egg-and-dart, as well as many voluted ornament forms, can be traced back ultimately to origins in Egyptian lotus ornaments. Maspero, like Goodyear and many others, ascribes to the lotus in Egyptian ornament a highly important magic or solar significance, but Flinders Petrie denies this. The Egyptian ornament lotus probably represents the blue or the white lotus; the rose lotus may be the parent flower of the lotus ornaments of Hindu art. Consult: A. C. T. E. Prisse d'Avennes, *L'Art égyptien* (3 vols., Paris, 1878–79); W. H. Goodyear, *Grammar of the Lotus* (London, 1891); W. M. Flinders Petrie, *Egyptian Decorative Art* (ib., 1895).

LOTUS BIRD. The Queensland parra. See Jacana.

LOTUS-EATERS (Lat. *Lotophagi*, from Λωτοφάγοι, from λωτός, *lōtos*, lotus + φαγεῖν, *phagein*, to eat). A mythical Libyan people, inhabiting a portion of Cyrenaica in northern Africa. These people were greatly dependent for subsistence on the fruit of a tree which also yielded an excellent wine, and it made those who partook of it forget all about their native land. The place was visited by Ulysses in his wanderings, and no sooner had his sailors eaten the fruit and partaken of the juice than they lost all desire of returning to Greece. The plant has been identified as the jujube (*Zizyphus lotus*). The people living on the coast of Tripoli now eat the jujube fruit and make from it a favorite drink. Other plants mentioned in this connection are the *Celtis australis*, the nettle tree, a member of the elm tribe which bears a small sweet fruit, and also the fig.

LOTUS TREE. See Hackberry.

LOTZ, lȯts, Wilhelm (1853–). A German biblical scholar. He was born in Cassel and studied at the Universities of Leipzig and Göttingen. In 1884 he became professor at Vienna and in 1897 at Erlangen, where he was director of the seminar for Old Testament exegesis. Among Lotz's publications are: *Inschriften Tiglathpilesers I* (1880), *Quæstiones de Historia Sabbati* (1883), *Geschichte und Offenbarung im alten Testament* (1892), *Die Bundeslade* (1901), *Biblische Urgeschichte* (1907), *Abraham, Isaak, und Jakob* (1910).

LOTZE, lō̆'ts*e*, Rudolf Hermann (1817–81). A German philosopher. He was born at Bautzen in Saxony and educated at Leipzig, where in 1838 he took doctor's degrees in medicine and philosophy and became a privatdocent in both subjects. In 1842 he was made professor extraordinary in the university, and two years later succeeded Herbart in the professorship at Göttingen. Here he did all his subsequent work. In 1881 he was called to Berlin, but delivered lectures there only part of a semester before his death on July 1, 1881. Among his more important works are: *Metaphysik* (1841); *Allgemeine Pathologie und Therapie als mechanische Naturwissenschaften* (1842); *Logik* (1843); *Allgemeine Physiologie des körperlichen Lebens* (1851); *Medizinische Psychologie oder Physiologie der Seele* (1852); *Mikrokosmus* (1856–64; 3d ed., 1876–80; Eng. trans., 4th ed., 1890); *Geschichte der Aesthetik in Deutschland* (1868). Of his projected definitive *System der Philosophie* only two parts were completed before his death—the *Logik* (1874; 2d ed., 1881) and the *Metaphysik* (1879); an English translation of both has appeared (Oxford, 1884; reprinted, 1887–88). After his death also appeared notes from his lectures on the important disciplines of philosophy (Eng. trans., ed. G. T. Ladd, 6 vols., Boston, 1884–87). Lotze was one of the most influential philosophers of the latter half of the nineteenth century. His main significance is to be found in his attempt to reconcile mechanism and teleology; i.e., to show that a scientific explanation of phenomena by efficient causation does not exclude purpose. Mechanism, instead of being antagonistic to teleology, he considered a necessary element in any true system of teleology; for it is only an aspect of the interrelation of things, and interrelation is essential to a world in which purpose may be realized. Relations do not obtain between independent things; they are states of things; they are as much attributes of things as sensible qualities are. Things, therefore, are not independent, but are essentially related. What these things are in their inner nature can be conceived only by analogy. Spirit is the only form of inner being that we know; hence following out this analogy he gets a system of monads (see LEIBNITZ), which he tends to think of as grounded in a supreme absolute personality or God. In his philosophy, especially of the absolute, Lotze is influenced more by the pressure of his feelings and emotions than by the demands of logic, and his idealism is ethical rather than intellectual. In psychology, his most noteworthy contribution was the local-sign theory, according to which the distinctive, nonspatial sense attributes, which vary according to the locality of the sense organs stimulated, are the original element out of which our space consciousness is built.

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LOUBAT, lo͞o′bȧ′, JOSEPH FLORIMOND, DUKE DE (1831–). An Americanist and patron of archæology. He was born in New York City, the son of a Frenchman from St. Martin. He was educated in Paris and was attached to the embassy of Württemberg in Paris from 1858 to 1865, except for a short time in 1859 when he was in Vienna. In 1866 he was one of the secretaries of the mission of Gustavus V. Fox (q.v.) to Russia and in 1873 wrote the *Narrative* of that mission. The University of Jena gave him an honorary degree in 1869 and Leo XIII made him a pontifical count and duke in 1888. He was a benefactor of the Catholic University of America in Washington, D. C.; gave money for the explorations in Central America of Maler, Seler, and Saville; bought the manuscript of Ximenes' *Historia de Guatemala*, with its Spanish version of the Popol Vuh; paid for the publication of such important Americana as the Borgian Mexican codex (1898 in facsimile; 1903, ed. by Seler) and for Borunda's edition of the *Clave general de jeroglificos americanos* (1898); founded Loubat prizes for American research at Columbia University (1892), at the Académie des Inscriptions (1888, 1906), at the University of Berlin (1889), the Royal Swedish Academy (1890), the Royal Academy of Madrid (1892), etc.; endowed chairs of American archæology—for Seler at the University of Berlin (1899), for Saville at Columbia (1903), and at the Collège de France (1902); pensioned (1910) the widows and families of deceased members of the Institute of France, of which he became a member in 1907; founded (1905) a chair of clinical therapeutics (held by Robin) in the University of Paris; and gave money (1903 and after) for French excavations at Delos. He wrote a *Medallistic History of the United States* (1878) and *A Yachtsman's Scrap Book* (1887), describing voyages in his yacht *Enchantress*.

LOUBET, lo͞o′bȧ′, EMILE (1838–). A French statesman, seventh President of the French Republic. He was born at Marsanne, Drôme, Dec. 31, 1838, the son of a prosperous peasant proprietor. Educated in law at Paris, he established himself at Montélimar, of which city he was mayor from 1870 to 1899, and, his legal ability having won for him wide recognition and influence, he was appointed counsel for the Paris, Lyons, and Mediterranean Railway. In 1876 he was elected to the Chamber of Deputies, where he joined the radical Republican group known as the Republican Left. Reëlected in 1877, he joined in the famous vote of want of confidence in the ministry of the Duke de Broglie. In 1885 he was chosen Senator; in December, 1887, he entered the cabinet of M. Tirard as Minister of Public Works, but retired with his colleagues in the following April; and Feb. 29, 1892, by appointment of President Carnot (q.v.), who was his personal friend, he became Premier, succeeding M. de Freycinet. He took in addition the portfolio of the Interior. His administration, lasting until November, was marked by a successful meeting of the problems arising from the miners' strike at Carmaux, and by the unearthing of the Panama scandal. (See LESSEPS, FERDINAND, VISCOUNT DE.) Upon a favorable vote in the Chamber on a resolution declaring that the government policy was too passive, he resigned. Reëlected to the Senate, he was chosen President of that body in 1896 and again in 1898. Two days after the sudden death (Feb. 16, 1899) of President Félix Faure (q.v.), the National Assembly chose M. Loubet President of the Republic, Jules Mélines being defeated. His presidency, which ended Feb. 18, 1906 (when he made way for his friend, Clément Fallières, q.v.), weathered the Dreyfus crisis, although Loubet, who belonged to that section of the Republicans favoring a revision of the Dreyfus case, was bitterly attacked for his attitude and was even assaulted by an anti-Dreyfusard. The strong anticlerical policy initiated during his administration culminated in the Church Separation Law of December, 1905; and much was done to develop secular education. Loubet's visit to Italy in 1894 had improved greatly the relations between France and Italy, but the French clericals had been irritated by his refusal to see the Pope. Unlike his predecessor Faure, he was a man of strong democratic tendencies and a representative of the French peasant proprietor class. As an orator, he possessed force and power of lucid expression, and as a statesman great diplomatic skill. Consult H. Avenel, *Le président Emile Loubet et ses prédécesseurs* (Paris, 1903). See FRANCE.

LOUDON, lou′dŏn, GIDEON ERNST. An Austrian general. See LAUDON.

LOUDON, lou′don, JAMES (1841–). A Canadian educator and physicist. He was born in Toronto and was educated at Upper Canada College and Toronto University. Shortly after graduating in 1862 he became instructor in classics in Toronto University, and later assistant professor of mathematics. In 1875–87 he was professor of mathematics and physics, in 1877 he became professor of physics and dean of residence, and in 1892–1906 he was president of Toronto University. He was president of the Canadian Institute (1876–78); one of the original fellows of the Royal Society of Canada (1872) and president thereof (1901–02); a member of the Ontario Educational Council (1890); and vice president of the British Association for the Advancement of Science (1897). He contributed various papers to the *Transactions* of the Canadian Institute, the *American Journal of Mathematics*, the *Philosophical Magazine*, and a number of other scientific and philosophical journals. He also published *The Elements of Algebra* (1873).

LOUDON, JOHN CLAUDIUS (1783–1843). A Scottish botanist, born at Cambuslang, Lanarkshire. He was educated in Edinburgh and in 1803 went to London as a landscape gardener. In 1806 he was elected to the Linnean Society and three years later he rented a large farm in Oxfordshire; but the investments, although at first remunerative, failed, and an accident to his right arm six years later at length (1825) required its amputation. In 1826 he first published the *Gardener's Magazine*, and in 1828 began the *Magazine of Natural History*. His great work, the *Arboretum et Fruticetum Britannicum*, issued in monthly parts, was a financial failure, and he was forced to take up his former occupation of landscape gardener, in which he had great success. He established and edited the *Architectural Magazine*, to which John Ruskin contributed. Among his writings are: *Observations on Laying Out Public Squares* (1803); *An Immediate and Effective Mode of Raising the Rental of the Landed Property of England* (1808); the *Encyclopædia of Gardening* (1822); the *Encyclopædia of Agriculture* (1825); the *Encyclopædia of Plants* (1829). The genus *Loudonia* was named after him.

LOUDOUN, lou′don, JOHN CAMPBELL, fourth EARL OF (1705–82). A British soldier, the only son of Hugh, third Earl of Loudoun. He succeeded his father in 1731, and from 1734 was a representative peer of Scotland. He entered the army in 1727 and took an active part on the side of the government in the rebellion of 1745. In March, 1756, he was sent out to command all the British forces in America. From Albany he issued orders for a much-reprobated embargo on all outgoing vessels in order to conceal a proposed attack on Louisburg. He then sailed from New York to Halifax, where he collected an army of 10,000 English and colonial troops and a large fleet; but hearing that the French fleet numbered one more vessel than his own, he lingered for a time in Nova Scotia, and then returned to New York without striking a blow. Upon the entry of Pitt to power Loudoun was recalled and General Amherst was appointed to his place. In 1762 Loudoun was sent as second in command with the English expedition to Portugal.

LOUGH, lŭf, THOMAS (1850–1922). A British politician, born in County Cavan, Ireland. He was educated in the Royal School at Cavan and the Wesleyan Connexional School at Dublin. In 1880 he became a tea merchant in London. He contested Truro in 1886 and was elected to the Commons in the Liberal interest from Islington in 1892, when he founded the London Reform Union. In 1905–08 he was Parliamentary Secretary to the Board of Education and in 1907 became His Majesty's Lieutenant of County Cavan. Lough wrote: *Glimpses of Early Ireland* (1888), *England's Wealth, Ireland's Poverty* (1896), *The Brussels Sugar Convention* (1903), *Ten Years' Tory Rule in Ireland* (1905).

LOUGHBOROUGH, lŭf′bŭr-ō. A manufacturing and market town in Leicestershire, England, 116 miles north-northwest of London and the second place of importance in the county (Map: England, E 4). Its chief buildings are the restored parish church dating from the fourteenth century, and the town hall and corn exchange. The endowed grammar school for boys dates from 1495 but it now occupies large modern buildings, as also does the school for girls belonging to the same foundation. The town is the railway centre of a rich agricultural district and has a fine market place. It has undergone much modern improvement, and owns its water, gas, and electric lighting, parks, markets, cemeteries, allotment gardens, and charities. The town utilizes its waste; it burns the garbage in special destructors which generate steam for the pumps of the sewage works, the sewage being utilized on farms. The town also supports a free library and provides technical instruction in arts and sciences. Hosiery and lace are its principal manufactures; it has iron foundries, and a bell foundry whence came the great bell (17½ tons) of St. Paul's, London. There are also machine shops, electrical works, etc. Loughborough dates from before the Norman Conquest, and the town and manor were bestowed upon Hugh Lupus by William I. It is mentioned in Domesday Book as Lucteburne. Pop., 1901, 21,500; 1911, 22,990.

LOUGH CORRIB, lŏk kŏr′ĭb. See CORRIB.

LOUGH FOYLE. See FOYLE, LOUGH.

LOUGH NEAGH. See NEAGH.

LOUIS I, lo͞o′ĭs *or* lo͞o′ĭ (*Fr. pron.* loo′ē′), THE PIOUS (called by the French *le Débonnaire*, i.e., "tender-hearted to the point of weakness") (778–840). Roman Emperor and King of the Franks from 814 to 840; youngest son of Charles the Great. His elder brothers having died, he succeeded his father in 814. Although not destitute of ability, his lack of energy and decision finally resulted in the dissolution of the Empire of Charles the Great. In 817 he apportioned the Empire among his three sons, Lothair, Pepin, and Louis, to take effect after his death, but he had Lothair crowned as Emperor. The others were dissatisfied, while Bernard, a nephew of Louis, who had been made King of Italy by Charles the Great, finding himself threatened by the new arrangement, revolted. The Emperor, getting Bernard into his power, put out his eyes, Bernard dying soon after as a result of his mutilation. In his remorse the Emperor did public penance and wished to enter a monastery, but yielded to the importunity of his advisers and in 819 married a second wife, Judith of Bavaria, who in 823 bore him a son, known in history as Charles the Bald. In 829, in the interest of this son, he made a new division of the Empire; but to this the elder sons, Lothair, Louis, and Pepin, objected, and the result was a state of disorder which lasted during the remainder of the Emperor's life. In 830 Louis had to yield and return to the former division of the Empire. In 831, however, he made a new division so as to provide for Charles; but he was deposed by his older sons in 833, on the famous Field of Lies. Lothair by his ambition incurred the hostility of his brothers, who conspired to restore their father to the throne. Pepin died in 838, and Louis made a new division the following year in favor of Lothair and Charles, leaving only Bavaria to Louis and excluding the son of Pepin. Against this arrangement Louis revolted and was joined by the son of Pepin. In the midst of the war the Emperor died near Ingelheim. He was buried at Metz. Consult: Simson, *Jahrbücher des fränkischen Reichs unter Ludwig dem Frommen* (Leipzig, 1874–76); Ernst Dümmler, *Geschichte des ostfränkischen Reichs*, vol. i (2d ed., ib., 1887); Ernest Lavisse, *Histoire de France*, vol. ii, part i (Paris, 1903).

LOUIS II (c.822–875). Roman Emperor from 855 to 875, son of Lothair I. He was made King of the Lombards in 844, was crowned Emperor in 850, and succeeded his father in Italy in 855. He was a weak ruler, and under him the power of the Empire declined rapidly. His conquests from the Saracens in the south of Italy were appropriated by the Greek Emperor. He left only one child, a daughter, married to Boso, King of Provence. Consult Ferdinand Gregorovius, *History of the City of Rome in the Middle Ages*, translated from the fourth German edition by Annie Hamilton, vol. iii (London, 1895).

LOUIS III (c.880–928). Roman Emperor. He was the son of Boso, King of Burgundy, and Irmengarde, daughter of the Emperor Louis II. In 887 he succeeded his father, under his mother's regency, as a vassal of Charles the Fat, but was not recognized as King until three years later. After the death of King Lambert (898) he engaged in a contest for the crown of Italy with Berengar I, and in 901 received the Imperial crown at Rome; but he was defeated by his rival Berengar and compelled to swear not to revisit Italy. In 904 Louis returned to Italy, and at first had some success, but was surprised and captured by Berengar, who put out his eyes and sent him back to Burgundy (905). During the last 20 years of his life his kingdom was administered by Hugh, his kinsman, who succeeded him. Consult Ernst Dümmler, *Geschichte des ostfränkischen Reichs* (2d ed., 3 vols., Leipzig, 1887–88).

LOUIS IV (c.1287–1347). Holy Roman Emperor from 1314 to 1347, surnamed THE BAVARIAN. He was a son of Louis the Strict, Duke of Upper Bavaria, and Matilda, daughter of the Emperor Rudolph I of Hapsburg. He and his brother Rudolph succeeded their father in 1294, their mother being Regent, but there was later a long contest between the brothers. In 1314 he was elected King of the Romans as the successor of Henry VII of Luxemburg. Four of the electors voted for him, but three declared in favor of his cousin, Frederick the Fair, of Austria, son of the Emperor Albert I and grandson of Rudolph of Hapsburg, the latter being proclaimed Emperor as Frederick III. In the war which ensued Louis won the battle of Mühldorf, Sept. 28, 1322, and took Frederick prisoner. Having by his support of the Visconti in Milan aroused the enmity of Pope John XXII, he was excommunicated in 1324, and was commanded by the Pope to appear before him; but Louis appealed to a general council, and the summons was declared null and void by the Diet of Ratisbon. In 1325 a treaty was concluded by which Frederick was released from imprisonment on condition that he return into captivity if he should find himself unable to induce his adherents to transfer their allegiance. Failing in his attempt, Frederick gave himself up in conformity with his oath, and was appointed Governor of the Bavarian possessions of Louis. In 1327 Louis plunged into conflict with the Pope, entered Italy, and was crowned King of Lombardy at Milan. In the following year he received the Imperial crown at Rome from the hands of Sciarra Colonna. (See COLONNA.) Through his influence John XXII was deposed, and Peter de Corvara was raised to the papal throne as Nicholas V. On his way back to Germany Louis was defeated near Milan (1329), and the Antipope Nicholas V was soon compelled to abdicate. The German princes, however, aided Louis in his struggles against the papacy at Avignon, and at a diet at Rense (q.v.) in 1338 the electors declared that the election of a German monarch needed no papal confirmation. In 1345 Louis added to his power by the acquisition of the dominions of Holland, Zealand, Hainault, and Friesland, which after the death of William IV of Holland descended to Louis's wife, Margaret of Holland. He died of a stroke of apoplexy. His court was noted on account of the many famous writers who gathered there to aid in the struggle against John XXII. Most notable among these was Marsilio of Padua (q.v.). Consult: W. Preger, *Beiträge und Erörterungen zur Geschichte des deutschen Reiches* (Munich, 1880); K. Müller, *Der Kampf Ludwigs mit der römischen Kurie* (2 vols., Tübingen, 1879–80); A. Chroust, *Beiträge zur Geschichte Ludwigs und seiner Zeit*, vol. i (Gotha, 1887); Schrohe, *Der Kampf der Gegenkönige Ludwig und Friedrich* (Berlin, 1902).

LOUIS I (Ger. **LUDWIG**) (1786–1868). King of Bavaria. The eldest son of King Maximilian I, he was born at Strassburg and was educated at Landshut and Göttingen, after receiving a thorough primary education at home. He fought unwillingly against Prussia in 1807, and against Austria in 1809. He early showed a taste for art and traveled twice to Rome while still a prince. In 1825 he succeeded to the throne. His reign was distinguished by the encouragement of the fine arts and the erection of magnificent public buildings. He moved the University of Landshut to Munich and called some of the greatest scholars in Europe to teach there. He himself wrote several poems and was an intimate friend of Goethe. Louis's reign was characterized in later years by contempt of constitutional rights and forms. Moreover, the King's private conduct gave great occasion for scandal, particularly in his connection with the dancer Lola Montez (q.v.). On account of the revolutionary disturbances in February and March, 1848, he resigned the crown in favor of his eldest son, Maximilian II.

LOUIS II (1845–86). King of Bavaria, born at Nymphenburg. He succeeded his father, Maximilian II, in 1864. He was a bachelor and eccentric, showing himself infrequently to his subjects, and being devoted more to art, especially music, than to the cares of government. His generosity towards Richard Wagner, the composer, upon whom he bestowed gifts and honors caused great comment in the country. He joined Prussia against France in 1870–71, though he did not go to the front in person, and favored the unity of Germany under the Imperial rule of William I. He followed his own caprices rather than the guidance of any political party, though he used his influence against the Ultramontanes. He piled up beautiful buildings, regardless of expense, and imposed an immense debt on the country. It was his extravagance that caused the ministers to have him declared insane, June 10, 1886. Three days later he drowned himself in the Starnberger. Consult: F. Gerard, *The Romance of Ludwig II, King of Bavaria* (London, 1899); J. F. Molloy, *Romance of Royalty* (2 vols., New York, 1904); Chlodwig Hohenlohe, *Denkwürdigkeiten* (2 vols., Stuttgart, 1907); Sebastian Raeckle, *Ludwig II. und Richard Wagner* (2d ed., Munich, 1913).

LOUIS II the Strict (1228–94). A Duke of Bavaria, grandson of Louis I and successor and son of Otho II. In 1253 he began to rule, together with his brother Henry, but two years afterward divided the duchy with him, taking for his own share Upper Bavaria and the Rhenish Palatinate. Louis's nickname, "the Strict," he gained by frequent fits of unreasonable severity. In 1256 he executed Mary of Burgundy, his first wife. He made many wars, and on the whole was the greatest Prince of his day in southern Germany. With the Archbishop of Mainz he urged the election of Rudolph of Hapsburg to the Imperial throne, and was the only one of the electors to stand by the Hapsburgs after Rudolph's death. He married, for his third wife, Mathilde, Rudolph's daughter, and left his lands to his sons, Rudolph and Louis. Consult Söltl, *Ludwig der Strenge* (Nuremberg, 1857), and Siegmund von Riezler, *Geschichte Bayerns*, vol. i (Gotha, 1880).

LOUIS III, Leopold Joseph Maria Aloys Alfred (1845–). King of Bavaria, son and successor (in 1912) of Leopold. He was born and was educated in Munich; entered the army, saw service and was severely wounded in the war with Austria in 1866; was prominent in Bavarian military matters and in the promotion of commerce, being one of the founders of the Verein für Kanal- und Fluss-schiffahrt; and represented his country at Moscow in 1896 at the Russian coronation. He married in 1868 the Archduchess Maria Theresa of Austria-Este, who died in 1903 and who was styled Queen Mary by the English Jacobites. Louis became Prince Regent on Dec. 13, 1912, the day after his father's death, and was acclaimed King on Oct. 31, 1913, upon the deposition of the mad King Otto, his cousin.

LOUIS VII the Bearded (1365–1447). A Duke of Bavaria-Ingolstadt. He was brother to Isabella, wife of Charles VI of France, and had a great influence on his brother-in-law. His greed won him the hate of the Parisian mob, from which he was barely rescued in 1413. In Germany his imperious temper kept him in continual quarrels, and in 1417 he was set upon by assassins, hired by Duke Henry the Rich, and severely wounded. In the politics of the period Louis was prominent. He joined the Marbach League in 1406; fought bravely and cruelly to win back the old Wittelsbach title of Margrave of Brandenburg from Frederick, brother-in-law of Duke Henry; and in 1433 fell under the papal ban for his persecution of monasteries in Bavaria. His son Louis (1404–45) made war on him in 1438 because of his partiality to Wieland, a natural child, captured him in 1443, and kept him in constraint until 1445. Then the Duke fell into the hands of his old enemy, Henry of Landshut, and died after a year in prison at Burghausen, his property going to Henry. Consult: Lang, *Geschichte Ludwigs des Bärtigen* (Nuremberg, 1811); Siegmund von Reizler, *Geschichte Bayerns*, vol. iii (Gotha, 1889); Michael Doeberl, *Entwicklungsgeschichte Bayerns*, vol. i (2d ed., Munich, 1908).

LOUIS I. King of the Franks. See Louis I the Pious.

LOUIS II le Bègue (the Stammerer) (846–879). King of the West Franks from 877 to 879. He was a son of Charles the Bald, and in 867 he was crowned King of Aquitaine. He succeeded his father in 877 and died April 10, 879. Louis had little power.

LOUIS III (862–882). King of the West Franks from 879 to 882. He was the son of Louis II. At his father's death he and his brother Carloman succeeded to the throne, although not without opposition, as their legitimacy was questioned. Louis expelled the Northmen from the region of the Loire and Somme, defeating them in a great battle at Saucourt, Aug. 3, 881, which has been commemorated in the *Chanson du roi Louis* and also in the German poem the *Ludwigslied*. He died Aug. 5, 882, in a frolic. Consult C. W. C. Oman, *European History* (New York, 1893).

LOUIS III (II) the Younger (c.825–882). A King of the East Franks, son of Louis the German. In 865 he received from his father, as his share of the kingdom, Franconia, Saxony, and Thuringia. He rebelled repeatedly against his paternal overlord. Louis the German died in 876 in the midst of a war against Charles the Bald, King of the West Franks. Louis the Younger in the same year defeated Charles at Andernach. He secured the royal title, and added Friesland and Bavaria to his possessions. Louis in 879 attempted to win the crown of the West Franks. In this he failed, but he became master of the whole of Lorraine. Consult Ernst Dümmler, *Geschichte des ostfränkischen Reichs* (2d ed., 3 vols., Leipzig, 1887–88).

LOUIS IV, called d'Outremer (from beyond the sea) (c.920–954). King of France from 936 to 954. He was a son of Charles the Simple and was taken by his mother to England in 923, where he was educated at the court of King Athelstan, his mother's brother, hence his surname. On the death of Rudolph of Burgundy, in 936, he was called to the French throne by Hugh of Paris and William of Normandy. At first his reign was troubled by a revolt headed by Hugh, who, dissatisfied with his policy, had allied himself with Otto the Great, and in 940 the latter invaded France. On the death of William of Normandy, Louis tried to wrest Normandy from the young Duke Richard, but was made prisoner. He was released after a year and soon was again engaged in a war with Hugh and Richard, which lasted until 950. He died Sept. 10, 954, leaving two sons, Lothair, who succeeded him, and Charles, who became Duke of Lower Lorraine. Consult Philippe Lauer, *Louis IV d'Outre Mer* (Paris, 1900).

LOUIS V le Fainéant (the Sluggard)

(c.967–987). King of France from 986 to 987. He was a son of Lothair and a grandson of Louis d'Outremer. He was associated with his father in the kingship in 979. He was the last King of the Carolingian dynasty in France. His surname was not justified. Consult Ferdinand Lot, *Les derniers Carolingiens, Lothaire, Louis V, Charles de Lorraine* (Paris, 1891).

LOUIS VI le Gros (the Fat) (c.1081–1137). King of France from 1108 to 1137. He was the son of Philip I and was associated with his father in the government in 1100; he succeeded his father in 1108. As King, he did much for the defense of the Church, but his main efforts were directed towards controlling the feudal lords of the Isle de France and adding to the royal domains. He destroyed many of the nobles' castles and never neglected an opportunity to gain additional lands, no matter how small the territory in question. From the beginning of his reign he was engaged in wars with Henry I of England. He died Aug. 1, 1137. Consult Achille Luchaire, *Louis VI le Gros* (Paris, 1889), and J. W. Thompson, *Development of the French Monarchy under Louis VI le Gros* (Chicago, 1895).

LOUIS VII le Jeune (the Young) (c.1121–80). King of France from 1137 to 1180. He was the son of Louis VI, whom he succeeded in 1137. Just before his father's death he had married Eleanor of Aquitaine (q.v.). In 1147 he went on the Second Crusade, accompanied by his wife, whose conduct in the Holy Land aroused much scandal. In 1152 he was divorced from Eleanor, who married within a few weeks Henry Plantagenet, bringing him as her dowry Aquitaine with other lands and making the English King more powerful in France than Louis himself. (See Henry II of England.) A war broke out at once between Henry and Louis, and lasted two years. Later there was other fighting between them. Louis died Sept. 18, 1180. Although not so vigorous as his father, he followed the policy of the latter and made his royal power respected. He aided especially in the foundation of *villes neuves* (new cities) and bound the interests of the middle class to the crown. Consult Hirsch, *Studien zur Geschichte König Ludwigs VII. von Frankreich* (Leipzig, 1892), and Ernest Lavisse, *Histoire de France*, vol. iii, part i (Paris, 1901).

LOUIS VIII le Lion (1187–1226). King of France from 1223 to 1226. He was the son of Philip Augustus. In 1215 and 1219 he engaged in crusades against the Albigenses. During the revolt of the English barons against John the crown was offered to him by a party among the nobles. In 1216 Louis landed in England, to which he laid claim as legitimate heir, and was well received; but the death of John and the accession of Henry III prevented his success. In 1217 he signed the Peace of Lambeth and withdrew after receiving a large war indemnity. He succeeded his father in 1223. In 1226 he led a crusade against the Albigenses and died while returning, Nov. 8, 1226. In his short reign Philip Louis followed faithfully the traditions of Philip Augustus and increased the royal power, especially in the south. His wife was Blanche of Castile (q.v.). Consult Charles Petit-Dutaillis, *Etude sur la vie et le règne de Louis VIII* (Paris, 1894).

LOUIS IX, known as Saint Louis (1214–70). King of France from 1226 to 1270. He was born April 25, 1214, and succeeded his father, Louis VIII, in 1226. His mother, Blanche of Castile, a woman of great talent and sincere piety, was Regent during his minority and bestowed on him a strictly religious education, which materially influenced his character and policy. In 1242 Louis became involved in a war with Henry III of England and defeated the English at Taillebourg and at Saintes. During a dangerous illness, in 1244, he made a vow that if he recovered he would go in person on a crusade, and accordingly, having appointed his mother Regent, he sailed in August, 1248, with a large army to Cyprus, whence, in the following spring, he proceeded to Egypt, thinking, by the conquest of that country, to open the way to Palestine. He took Damietta, but was afterward defeated and taken prisoner by the Mohammedans, April 5, 1250. A ransom of 800,000 besants procured his release on May 6, 1250, together with the survivors of his army. He proceeded by sea to Acre and remained in Palestine till 1254. He now applied himself earnestly to the affairs of his Kingdom, united certain provinces to the crown on the lapse of feudal rights or by treaty, and made many important changes, the general tendency of which was to increase the royal power. The code of laws known as the *Etablissements de Saint Louis* is, however, only the work of a private compiler. Louis embarked on a new crusade July 1, 1270, and proceeded to Tunis; but a pestilence broke out in the French camp which carried off the greater part of the army and the King himself. He died Aug. 25, 1270, and his son, Philip III, was glad to make peace and return to France. Pope Boniface VIII canonized Louis in 1297. He was the most distinguished monarch of his time. His piety, justice, and mercy caused him to be trusted, while his ability made him respected. Joinville's *History of Saint Louis* is the best source of information as to the character of the King, as seen by a shrewd contemporary, who was intimate with Louis.

Bibliography. J. A. F. Faure, *Histoire de Saint Louis* (2 vols., Paris, 1866); Langlois, *Saint Louis* (ib., 1887); Lecoy de la Marche, *La France sous Saint Louis* (ib., 1893); Berger, *Saint Louis et Innocent IV* (ib., 1893); id., *Histoire de Blanche de Castille* (ib., 1895); Frederick Perry, *Saint Louis the Most Christian King* (New York, 1901); Ernest Lavisse, *Histoire de France*, vol. iii, part ii (Paris, 1901); M. C. A. Sepet, *Saint Louis* (7th ed., ib., 1905); Jean, Sire de Joinville, *Saint Louis, King of France*, translated by James Hutton (London, 1910).

LOUIS X le Hutin (the Quarreler) (1289–1316). King of France from 1314 to 1316. He was the eldest son of Philip IV. During his short reign the government was mainly in the hands of ministers. When he died, on June 5, 1316, there was for the first time no direct male heir in the Capetian dynasty. A posthumous son (John I) was born, but he died in a few months, and the throne went to Louis's brother, Philip V.

LOUIS XI (1423–83). King of France from 1461 to 1483. He was the eldest son of Charles VII and was born at Bourges, July 3, 1423. Louis was by nature cruel, tyrannical, and perfidious, and in 1446 and 1456 he made unsuccessful attempts against his father's throne. He was compelled to flee to Flanders in 1456 and sought the protection of Philip the Good, Duke of Burgundy, with whom he remained till his father's death in 1461, when he succeeded to the crown. He lived simply and traveled constantly in order to learn all about his Kingdom. He was very devout and gave much to the Church. He had great ability to attract people and was skillful as a diplomat. He employed mainly people of humble rank and was prodigal to those who served him faithfully. The severe measures which he adopted against the great vassals led to a coalition against him, at the head of which were the great houses of Burgundy and Brittany. (See LEAGUE OF THE PUBLIC WEAL.) Louis owed his success over the nobles more to his artful policy than to arms. When the war threatened to break out anew, he invited Charles the Bold (q.v.), Duke of Burgundy, to a friendly conference at Péronne in October, 1468. His agents meanwhile had stirred up the people of Liége to revolt against the Duke, upon the news of which occurrence Charles made the King a prisoner and extorted from him a humiliating treaty. Louis, however, did not observe this treaty, and a contest broke out, which lasted until the death of Charles the Bold, in 1477. Charles was aided by Edward IV of England, while Louis incited the Swiss and René of Lorraine to oppose the ambitious undertakings of Charles. Charles the Bold left an only daughter, the celebrated Mary of Burgundy, who married Maximilian of Austria. Louis claimed a great part of the Burgundian territories as male fiefs lapsed to the superior. He seized the Duchy of Burgundy, conquered Artois, and subjugated Franche-Comté. War was waged with Maximilian until 1482, when the Treaty of Arras was concluded, by which the daughter of Maximilian was betrothed to the Dauphin, afterward Charles VIII, and Louis was allowed to retain his conquests. In 1480–81 Anjou, Maine, and Provence were united with the crown. By his warfare against the feudal lords Louis XI rid France of the anarchical conditions which had prevailed and made the central power paramount. He died Aug. 30, 1483. He also materially advanced civilization in France by encouraging manufactures, commerce, and mining. He improved the public roads and canals, aided in establishing printing presses, and founded a university. One of his officials during a large part of his reign was the historian Philippe de Commynes (Comines). Consult: Jules Michelet, *Histoire de France*, vol. vi (Paris, 1879); Henri Sée, *Louis XI et les villes* (Paris, 1891); G. W. K. Kitchin, *History of France*, vol. i (Oxford, 1896); Ernest Lavisse, *Histoire de France*, vol. iv, part ii (Paris, 1902); Christopher Hare (pseud.), *The Life of Louis XI* (London, 1907).

LOUIS XII (1462–1515). King of France from 1498 to 1515. He was the son of Charles, Duke of Orleans, and was born at Blois, June 27, 1462. During the reign of Charles VIII he set himself up in opposition to the court and was imprisoned for three years (1487–90). He took part in the Italian campaign of 1494, capturing Genoa and threatening Milan. Upon the death of Charles VIII without issue, Louis succeeded to the throne and in 1499 married Anne of Brittany, the widow of his predecessor, thus assuring the permanent union of Brittany with France. His reign was marked by widespread reforms in the finances and the administration of justice, carried out under the direction of his Chancellor, the astute Cardinal d'Amboise (q.v.), and the mildness of his rule and the prosperity which France enjoyed under him gave him the title of *Père du peuple.* In 1499 Louis, as grandson of Valentina Visconti, daughter of the famous Gian Galeazzo, Duke of Milan, laid claim to that state, and in August of the same year a French army of some 20,000 men invaded the country, overthrew Ludovico Sforza, and in October took the city of Milan. By the Treaty of Granada, in November, 1500, Louis and Ferdinand of Aragon agreed upon the conquest and partition of the Kingdom of Naples. The victors quarreled over the spoils, and in 1503 the French were driven from southern Italy by Gonsalvo de Córdoba. In December, 1508, Louis joined the League of Cambrai, formed by the Pope against Venice, and including in addition Ferdinand of Aragon and the Emperor Maximilian. In May of the following year Louis won the battle of Agnadello, which effectually crushed the power of Venice. The jealousy of his allies led to the conclusion of the Holy League (1511), in which the Pope, Venice, Ferdinand, and Henry VIII of England united against France. After a victory at Ravenna (April, 1512), where their heroic general, Gaston de Foix, fell, the French were driven out of Lombardy. At the same time Louis was hard pressed by Henry VIII, who landed in France with a strong army and won the Battle of the Spurs in August, 1513. As a part of the peace settlement concluded in 1514 with the Emperor (who had joined the allies), England, Spain, and the Pope, Louis took (1514) for his third wife Mary Tudor, sister of the English King. He died Jan. 1, 1515, leaving two daughters by Anne of Brittany. He was succeeded by his son-in-law, Francis I of Angoulême. Consult: Paul Lacroix, *Louis XII et Anne de Bretagne* (Paris, 1882); Jehan d'Authon, *Chroniques de Louis XII* (ib., 1889–95), a contemporary account; M. A. R. Clavière, *Histoire de Louis XII* (ib., 1890 et seq.); Henri Hauser, *Les sources de l'histoire de France, XVIe siècle* (ib., 1906).

LOUIS XIII (1601–43). King of France from 1610 to 1643. He was the son of Henry IV and Maria de' Medici and was born at Fontainebleau, Sept. 27, 1601. He succeeded to the throne on the assassination of his father, May 14, 1610, his mother becoming Regent. Louis XIII took little personal share in the government, though formally declared of age in 1614. In the following year he married Anne of Austria, daughter of Philip III of Spain. The government remained in the hands of the Queen mother and her favorite, Concini (Marshal d'Ancre, q.v.), until April, 1617, when the latter was murdered at the instance of the Duke de Luynes, a courtier who had succeeded in establishing a complete ascendancy over the mind of the King. The Queen mother was banished to Blois, and for a time there was danger of civil war between the King's party and the adherents of Maria de' Medici. The Duke de Luynes died in 1621, and for a time the chief power was in the hands of La Vieuville, through whose influence Richelieu (q.v.) entered the King's Council in 1624. Richelieu speedily became the chief minister of Louis. His powerful mind obtained complete control over that of the King, and his policy effected that increase of monarchical power at the expense of Protestants, nobles, and parliaments, which reached its consummation in the reign of Louis XIV. The Huguenots, during the early years of Louis XIII's reign, had shown a restlessness which, combined with their efficient organization, seemed to menace the power of the monarchy. Their influence, which was especially strong in Béarn and Navarre, was weakened by the annexation of those two little states to France. In 1621 this resulted in a formidable rising of the Huguenots in the south, who were led by Rohan and Soubise. After desultory fighting peace was concluded at Montpellier, which left to the adherents of the Reformed religion, of all their fortified places, only La Rochelle and Montauban. The repression of the Huguenots was carried on by Richelieu. The last of their strongholds, La Rochelle, was taken in October, 1628, and the political power of the Huguenots was gone forever. In foreign politics Richelieu continued the anti-Hapsburg policy of Henry IV. In 1630 the War of the Mantuan Succession was terminated in favor of Richelieu's candidate, Charles of Nevers; but it was the Thirty Years' War (q.v.) which supplied Richelieu with the great opportunity of humiliating the power of the Hapsburgs. Gustavus Adolphus was an ally of France, and after his death the Swedish forces continued to be subsidized by the French King, while the able Protestant general, Bernhard of Weimar, was maintained in the field with French money. The policy of Richelieu resulted in the acquisition of Alsace. In the south Roussillon was annexed in 1641. Richelieu maintained his ascendancy over the King in spite of intrigue and conspiracies on the part of the court. In 1632 Gaston of Orléans, brother of the King, led a Spanish army into France for the overthrow of the hated minister, but he was defeated at Castelnaudary. A rising under the Count de Soisson was repressed in 1641, and this was followed by the unsuccessful conspiracy of Cinq-Mars (q.v.). Louis died May 14, 1643, less than half a year after his great minister. His Queen, after 23 years of married life, bore a son in 1638, who succeeded to the throne as Louis XIV; and in 1640 a second son, Philip, Duke of Orléans, the ancestor of the present house of Orléans.

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LOUIS XIII, XIV, XV, XVI, STYLES OF. See LOUIS TREIZE, LOUIS QUATORZE, LOUIS QUINZE, LOUIS SEIZE.

LOUIS XIV (1638–1715). King of France from 1643 to 1715, called THE GREAT. He was the son of Louis XIII and Anne of Austria and was born at Saint-Germain-en-Laye, Sept. 15 (?16), 1638. He became King of France at the age of five by the death of his father, May 14, 1643. The Queen mother, Anne of Austria, held the regency; but the virtual control of affairs was in the hands of Mazarin, the chief minister, who was more solicitous for the continuance of his own power than for the education of the young King. The discontent of the nobles under the administration of Mazarin brought on the civil wars of the Fronde (q.v.) fomented by Spain, but the rebellion was put down in 1652. The war with Spain, a legacy from the preceding reign, was terminated by the Peace of the Pyrenees in 1659, which gave France part of the Spanish Netherlands and confirmed her in the possession of Roussillon. In 1660 Louis married the Infanta Maria Theresa of Spain. Mazarin died March 9, 1661, and at once the young King showed to what purpose he had studied the example of his father's subserviency to Richelieu and the experience of his own tutelage under Mazarin. He surprised the court by his prompt assertion of the intention to be his own chief minister. Richelieu and Mazarin had established firmly the foundations of royal power by putting down the nobles and Huguenots and by the foreign policy which had made France the greatest power in Europe. Louis XIV built on this foundation a structure of the most complete despotism. The young King brought to the task a zest for work which had not been destroyed by a neglected education or the pleasures of a frivolous court. Lacking in surpassing intellectual qualities himself, he had the gift of recognizing talents in others, and he gathered around him a group of advisers of exceptional ability, whose activity he knew how to subordinate to his own purposes. The brilliant services which they rendered France, far from eclipsing the reputation of the King, redounded only to his own glory. From the *Grand Monarque* alone emanated that vivifying power under the influence of which the national life of France, its industry and commerce, its military strength, its political influence in Europe, attained an unprecedented development. The court of Louis XIV was the most magnificent in Europe, and it became the model for European sovereigns. His most influential adviser was Colbert (q.v.), his Minister of Finance (1661–83), who reorganized the finances of the Kingdom, which had been impoverished by Mazarin and pilfered by the pleasure-loving Fouquet (q.v.), fostered industries, and by a drastic application of the protective principle of state encouragement, or what was afterward known as mercantilism, made France a self-supporting and highly productive country. Louvois, who succeeded his father, Le Tellier, as Minister of War, brought the army to a pitch of efficiency which made it the first in Europe. Thus the means were provided for the foreign wars which were almost continuous through the King's long reign. Foreign conquests for France meant expansion at the cost of Spain, whose possessions in the Netherlands were Louis's first point of attack. After the death of Philip IV of Spain (1665) Louis laid claim in the name of his wife to certain portions of the Netherlands, as well as Luxemburg and Franche-Comté, basing his claim on various laws of succession prevailing in those provinces. There followed the so-called War of Devolution. In May, 1667, an army of 50,000 men under Turenne invaded the Spanish Netherlands and within three months overran a great part of the country. The Dutch, in alarm, concluded an alliance with England and Sweden to put a stop to the encroachments of France, and in May, 1668, peace was signed at Aix-la-Chapelle, the French King giving back Franche-Comté, but retaining possession of French Flanders. Louis adhered tenaciously to his purpose, however, and, having effected alliances with the Archbishop of Cologne and the Bishop of Münster, whose territories lay to the east of the Netherlands, and having bought off Charles II of England, he seized Lorraine in 1670 and invaded Holland in 1672. The States-General of the Netherlands made an alliance with Spain, Brandenburg, and the German Emperor (1673), to which Louis retorted by seizing Imperial cities in Alsace. Four great armies were put into the field. Condé carried on the campaign on the Meuse, Turenne overran Alsace and Lorraine, Schomberg was intrusted with the defense of Roussillon, while Louis in person with the great engineer Vauban led an army into Franche-Comté, which was speedily and definitely conquered (1674). In the Netherlands Condé won a victory over the Dutch, Germans, and Spanish at Seneffe (August 11). After a number of reverses in 1675, occasioned by the death of Turenne, the French armies entered once more upon a series of victories in the Spanish Netherlands, and in March, 1678, Ghent and Ypres were taken. The treaties of Nimwegen (1678–79) restored the territory taken from Holland, under a guaranty of neutrality, but left to France 14 cities in Flanders, Franche-Comté, and Freiburg in the Breisgau, and imposed such onerous conditions on the Duke of Lorraine that that Prince allowed his state to remain in the hands of the French rather than accede to them. Louis was now at the height of his power, and his arrogant ambition knew no bounds. He established at Metz, Breisach, Besançon, and Tournay French courts of claims (*chambres de réunion*), which proceeded to determine what territories belonged to France under the last four international treaties. The chambers decided that with the cities and principalities conquered by France went all territorial possessions which at any time might have been theirs. French armies executed the decisions, adding Strassburg and many border towns to France. France was now dominant in Europe, and its power felt even in northern Africa, where the depredations of the Barbary pirates led to the bombardment of Tripoli (1681 and 1685) and Algiers (1682 and 1683) by a French fleet. At home Louis ruled like an Oriental despot. The patriotic ambition of the nobility had been strangled along with their unruliness, and they were for the most part content to be mere satellites of the King. The provinces were governed by royal intendants, and every detail of government was rigidly watched by the King. The power of the Church was also brought under the control of the King. The liberties of the French church as against the Pope were asserted in the National Council of 1682 (see GALLICAN CHURCH), but at the same time uniformity of belief was enforced by the suppression of the Jansenists and the enactment of stringent measures against the Huguenots, who were living peacefully protected by the Edict of Nantes. Arrogant and obstinate as he was, Louis was restrained in many things by the counsel of Colbert until the death of that Minister, in September, 1683. His death had been preceded by that of the Queen, and in 1684 Louis privately married Madame de Maintenon (q.v.), who for a long time had been his spiritual guide. The Huguenots were gradually subjected to more and more pressure (see DRAGONNADES), and in 1685 the King finally revoked the Edict of Nantes. The exercise of the Reformed religion in France was prohibited, and children were to be educated in the Catholic faith. (See HUGUENOTS.) On the death of the Elector Palatine, in 1685, Louis claimed the territory of the Palatinate in right of the Elector's sister, the Duchess of Orléans. In 1688 he invaded the Palatinate and the neighboring regions. Early in 1689 the Minister of War, Louvois, doubting the possibility of defending the Palatinate, ordered the devastation of that region—an act of inexcusable cruelty, which reduced half a million of people to utter misery. A new coalition was now formed against France, guided by the energy and wisdom of William of Orange, just called to the throne of England. This league, the Grand Alliance, ultimately included England, Holland, Savoy, the Emperor, Brandenburg, Sweden, Spain, Saxony, Bavaria, and the Palatinate. The succeeding campaigns were largely waged in the Netherlands, while Marshal Catinat reduced Savoy. On July 1, 1690, Marshal Luxembourg defeated the Prince of Waldeck at Fleurus; on Aug. 3, 1692, he gained a decisive victory over William III at Steenkerke, and on July 29, 1693, won a second victory at Neerwinden. At sea the French under Tourville gained a great success over the English and Dutch off Dieppe (July, 1690), but this was counterbalanced by the crushing defeat of the French at La Hogue in May, 1692. The advance of the French, who were now under the command of the incapable Villeroi, was checked by the Fabian tactics of William III, who took Namur in 1695 and thus hastened the approach of peace, of which France stood in great need, exhausted as she was by these campaigns. In 1697 the Peace of Ryswick provided for a mutual restoration of conquests and the garrisoning of the forts in the Spanish Netherlands by Dutch troops as a barrier between France and Holland. Louis was forced to recognize William III as lawful King of England and to abstain from lending aid to the exiled Stuarts. Meanwhile Louis was able to maintain his rule at home in the face of growing discontent only by a rigid police espionage administered by Count d'Argenson. The national finances, restored by the somewhat artificial system of Colbert, were again in a deplorable condition, and the people were threatened with want. The last years of Louis were a period of misfortune as great as his previous successes had been. The question of the succession to the throne of Spain, left vacant by the childless Charles II, led to the tremendous struggle of the War of the Spanish Succession. (See SUCCESSION WARS.) William revived the Grand Alliance in 1701 to combat the plans of Louis for placing his grandson, Philip of Anjou, upon the Spanish throne. The allies took the field under the able generalship of Marlborough and Prince Eugene and won the great battles of Blenheim (1704), Ramillies (1706), and Oudenarde (1708). After these French disasters negotiations for peace were entered upon, but, though Louis was willing to comply with all the demands of the allies in regard to the restoration of his early conquests and to recognize the Austrian Archduke Charles as King of Spain, he would not consent to join the allies in driving his grandson out of Spain. Hostilities were resumed, and Marlborough and Prince Eugene inflicted a bloody defeat on the French at Malplaquet (1709). Fortune, however, favored the French King. The death of the Emperor Joseph I and the accession of the Archduke Charles (Charles VI) in the Austrian dominions and the German Empire created dissensions in the ranks of the allies; the fall of Marlborough (1712) removed Louis's greatest enemy. The treaties of Utrecht (1713) and Rastadt (1714) brought the war to a close. Philip of Anjou retained the Spanish crown, which, however, was shorn of its possessions in Italy and the Netherlands. France ceded Acadia to England. The obstinate policy of aggrandizement by despotic methods and of the repression of the natural tendencies of the people had its result after a period of factitious glory in a decline of the French power. The looseness and immorality of society, to which the King gave the tone, was another cause of decay. Domestic misfortunes embittered the last years of the King's life. Within the space of a year (1711–12) death carried off the Dauphin Louis, the heir to the throne, together with his two sons, the Dukes of Burgundy and Berry, and the Duke of Burgundy's eldest son, the Duke of Brittany. Upon Louis, the second son of the Duke of Burgundy, a sickly child whose life was for a time despaired of, fell the succession to the crown. By his mistress, Madame de Montespan, Louis had two sons, who bore the titles of Duke of Maine and Count of Toulouse. On Sept. 1, 1715, the aged King died at Versailles. His reign had lasted 72 years. The epigrammatic statement, *L'Etat c'est moi*, attributed to him, well described his rôle in French history. The extension of monarchical authority and of his own personal power was the predominant motive with him. Successes in foreign affairs and centralization of government at home were his main ambitions. Although he has been called not without reason "by far the ablest man who was born in modern times on the steps of a throne," his achievements no less than his deficiencies prepared the way for the coming revolution. His life was identified with the zenith of the French power, and his reign witnessed an extraordinary development in letters and arts. Among those whose names adorn this so-called Augustan age are Corneille, Racine, Molière, Pascal, Boileau, Bossuet, Fénelon, La Fontaine, La Rochefoucauld, Poussin, Claude Lorrain, Mansart, and Claude Perrault. Although his reign was marked by great splendor and by real achievements in literature and the arts, this brilliance was bought at the expense of inner decay and increasing misery among the masses.

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LOUIS XIV, STYLE OF. See LOUIS QUATORZE.

LOUIS XV (1710–74). King of France from 1715 to 1774. He was the son of the Duke of Burgundy, who died in 1712, and a great-grandson of Louis XIV. He was born at Versailles, Feb. 15, 1710, and succeeded to the throne Sept. 1, 1715. The Duke of Orléans, as first Prince of the blood, was Regent during the minority of the King, whose education was intrusted to Marshal Villeroi and Cardinal Fleury. The country was brought to the verge of ruin during the regency by the folly of the Regent and the financial schemes of the Scotchman John Law (q.v.). When Louis was 15 years of age, he married Maria Leszczynska, daughter of Stanislas, the dethroned King of Poland. Fleury was at the head of affairs from 1726, when he succeeded the Duke of Bourbon as Prime Minister, to 1743, and by parsimony succeeded in improving the condition of the finances. It was his policy also to avoid war, in which, however, Louis was involved in 1733, in support of his father-in-law's claim to the throne of Poland. (See SUCCESSION WARS, *War of the Polish Succession.*) By the Peace of Vienna (1738) Stanislas renounced his claims to Poland, but received Lorraine and Bar, which devolved upon France at his death (1766). In 1740 France was drawn into the War of the Austrian Succession. After Fleury's death the King, whose life had been passed in idle sensuality, made a spasmodic return to virtue. He took the field in 1745, but in the following year was struck down by a dangerous illness at Metz. The grief of the nation, expressed in general prayers for his recovery, gained him the title of *le bien-aimé* (the well-beloved). The King recovered and in 1745 was present at the battle of Fontenoy, but speedily relapsed into his old life and fell completely under the influence of Madame de Pompadour, who ruled Louis and France for nearly 20 years, directing especially the foreign policy of the country. Vast sums of money were lavished on the all-powerful mistress and on the bacchanalian pleasures with which she knew so well how to please the jaded senses of the profligate King. The Peace of Aix-la-Chapelle, which terminated the War of the Austrian Succession (1748), was but an intermission in the great struggle which was finally to be fought out between France and England and between Austria and Prussia. In 1756 an extraordinary alliance between France and Austria, contrary to the historic policy of the two great rivals, was effected by the diplomacy of Kaunitz (q.v.) and the influence of Madame de Pompadour. There followed the Seven Years' War (q.v.), which resulted in the humiliation of France, defeated by land and sea, and the loss of her colonial empire in America and India by the Peace of Paris (1763). In 1761 a contest broke out between the Parlements and the Jesuits, the former being actuated by motives of traditional hatred, inasmuch as they were the strongholds of Jansenism. The influence of Madame de Pompadour and her favorite, the first Minister Choiseul, were thrown into the scale against the Jesuits, and, though the King was at first inclined to favor them for fear of Rome, the Parlements won the day. In 1762 the Jesuits were declared a corporation hostile to the interests of the state, and in 1764 the order was suppressed. (See JESUITS.) The Parlements, emboldened by their success in this contest, now attempted to limit the power of the crown by refusing to register edicts of taxation; but the King acted with unusual vigor, maintaining his own absolute and supreme authority and treating the attempts of the Parlements to unite for one object as rebellious. Choiseul, who had conducted foreign affairs with a certain skill, was displaced from office (1770), a new mistress, Madame Du Barry (q.v.), having now come into the place which had been so long occupied by Madame de Pompadour, and a ministry was formed under the Duc d'Aiguillon, the most prominent member of which was the Chancellor Maupeou (q.v.), who immediately showed himself a relentless enemy of the Parlements. The Parlement of Paris was abolished, its members banished to the provinces, and a more facile instrument of the royal will, the *conseil du roi*, took its place. This arbitrary act deeply moved the popular indignation. The King, when told of the ruin of the country and the misery and discontent of the people, only remarked that the monarchy would last as long as his life (*Après moi le déluge*) and continued immersed in sensual pleasures. Notwithstanding the bankrupt state of the finances, it is estimated that in five years he lavished more than 100,000,000 livres on Madame Du Barry. He died of smallpox, May 10, 1774. The maladministration and disorganization which had developed during his reign brought about the financial debacle of the monarchy, which was the preliminary of the French Revolution; while, on the other hand, the writings of the philosophers of the enlightenment—Voltaire, Rousseau, and the encyclopedists—had been preparing the minds of the people for a change. He was succeeded by his grandson, Louis XVI.

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LOUIS XV, STYLE OF. See LOUIS QUINZE.

LOUIS XVI (1754–93). King of France from 1774 to 1792. He was the third son of the Dauphin Louis, only son of Louis XV, and was born at Versailles, Aug. 23, 1754. By the death of his father and his elder brothers he became Dauphin (1765). He was a lover of hunting and manly exercises, showed an aptitude for mathematics and mechanics, and in the midst of the most corrupt of courts he grew up temperate, honest, and moral; but he was a weak and incapable ruler. He was married, May 16, 1770, to Marie Antoinette, the youngest daughter of the Empress Maria Theresa. When Louis ascended the throne, misery and discontent prevailed throughout France. He lacked the vigor and judgment necessary for the circumstances, but was conscious of his own weakness. He made Maurepas, an old courtier, his Prime Minister; but among his ministers were Malesherbes, Turgot, and other men of known patriotism; and his accession was signalized by the remission of some of the odious taxes, the abolition of the relics of serfdom and of the torture in judicial investigations, a reduction of the expenditure of the court, and the foundation of institutions for the benefit of the working classes. He was for a time popular; but deep-reaching reforms were rendered impossible by the opposition of the court, headed by the pleasure-loving Marie Antoinette. Turgot resigned in 1776. In June, 1777, when the state of the finances seemed nearly desperate, Necker (q.v.) was called to the office of Comptroller General and succeeded in bringing them to a more tolerable condition, without any very radical change; but after the interference of France in the American War of Independence, he was obliged to propose the taxation of the privileged classes, hitherto exempted. Their resistance compelled him to resign, and Joly de Fleury succeeded him; but the general discontent induced the King, in 1783, to appoint as Comptroller General Calonne (q.v.), who found money for a time by borrowing, much to the satisfaction of the courtiers. But, the indignation of the people increasing, Calonne found it necessary to recommend the convening of an Assembly of Notables (q.v.). On May 1, 1787, the Archbishop Loménie de Brienne became Finance Minister. He obtained from the Notables some concessions and some new taxes. But the Parlement of Paris refused to register the edicts of taxation, as oppressive to the people, and the extravagance of the court and the Queen began to be freely spoken of. The convening of the States-General was demanded from every corner of France. The King forced the Parlement to register the edicts in a *lit de justice* and banished the councilors of the Parlement to Troyes, but erelong found it necessary to recall them and met an even stronger opposition than before. Recognizing the hopelessness of reform, Brienne was compelled to resign, and Necker again became Minister in August, 1788. An assembly of the Estates of the Kingdom was resolved upon, and, by the advice of Necker, who wished a counterpoise to the influence of the nobility, clergy, and court, the Third Estate was called in double number. The subsequent history of Louis XVI is inseparably connected with the events of the first four years of the French Revolution (q.v.). His total lack of purpose at a time of crisis when decision was imperative proved his ruin. He wavered between the cause of the Revolution and the counsels of the Royalists and succeeded in losing the confidence of both parties. Influenced by the resolute attitude of the Third Estate, he ordered the nobility and the clergy to join the former in the National Assembly; yet this was followed, on July 11, 1789, by the dismissal of Necker, whom, however, popular indignation compelled the King to recall. On October 5 a Parisian mob, composed mostly of women, incited by the rumor of Royalist plottings, marched upon Versailles and on the following day brought the royal family to Paris, where they made their home in the Tuileries. The death of Mirabeau (q.v.) weakened greatly the more conservative popular party who favored the preservation of the monarchy under careful limitations, and on the night of June 20–21, 1791, the royal family made their unfortunate attempt to escape to the eastern frontier, where Bouillé (q.v.), commander of the troops at Metz, a Royalist in sympathies, was prepared to lend them succor. At Sainte-Menehould the King and his family were recognized by Drouet, the son of the postmaster, who pursued them into Varennes, where he raised an alarm and caused the fugitives to be seized. The King returned to Paris, and from that day his fall was inevitable, the flight to Varennes having served to confirm the general reports concerning the King's negotiations with the emigrant nobles and the foreign Powers for the overthrow of the newly conquered liberties of the nation. On Sept. 14, 1791, he took the oath to the new constitution, but his deposition had already been decided on by the party of the Gironde. On June 20, 1792, an organized mob invaded the Tuileries, forced the King to don the liberty cap, and departed after heaping insults on the unhappy Marie Antoinette. On August 10 a still more formidable mob stormed the Tuileries, massacred the Swiss Guard (q.v.), and compelled the royal family to seek refuge in the hall of the Assembly. The King was suspended from his functions and sent a prisoner to the Temple. The Convention which met on September 21 immediately proclaimed France a Republic, and in December the deposed King was brought to trial before the Convention on charges of treason. The King defended himself with dignity, but neither his own words nor the eloquence of his counsel (Malesherbes, Tronchet, and Desèze) could avail against the evident determination of the Mountain to bring about his death. The King was found guilty, and on Jan. 16, 1793, was condemned to death, by 361 to 360. The Girondists, who were opposed to the extreme penalty, were forced to vote for death out of fear of the Mountain. On January 21 Louis was guillotined on the Place de la Révolution. Louis XVI had two sons and one daughter. The older son died in 1789, the younger becoming Dauphin (see LOUIS XVII); the daughter was the Duchess of Angoulême.

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LOUIS XVI, STYLE OF. See LOUIS SEIZE.

LOUIS XVII, CHARLES (1785–95). Titular King of France after the execution of Louis XVI on Jan. 21, 1793. He was born on March 27, 1785, the second son of Louis XVI and Marie Antoinette. After the death of his brother, June 4, 1789, he became heir to the throne, but together with the royal family he was imprisoned in the Temple after Aug. 10, 1792. His fate was a most pitiful one, for he was ultimately delivered over to a brutal shoemaker named Simon, and died from neglect and abuse on June 8, 1795. Though there could be no question of the death of the real Louis XVII, various claimants arose, who had all some followers. After two other claimants had disappeared there appeared in 1828 one François Henri Hébert, "Duke of Richmont," who carried on a propaganda until his death, in 1845. Then a Prussian named Naundorff, who showed indeed a remarkable family likeness to the Bourbons, and his descendants sought, for a time after 1830, to enforce their so-called claims. Naundorff died in Delft, 1845, but his children sued the Comte de Chambord in 1851 and 1874 in the Parisian courts. (Consult *Abrégé de l'histoire des infortunes du Dauphin*, London, 1836.) About the middle of the nineteenth century many people firmly believed that the lost Dauphin had been found in America in the person of Eleazar Williams, an Episcopal clergyman and missionary to the Indians, of which race his putative great-grandfather was. He seems to have been convinced that he was a Bourbon, and sufficient arguments were brought forward to furnish a book in defense of his claim (Hanson, *The Lost Prince*, New York, 1854); but some of these arguments were afterward disproved, and the belief lost ground. No one has explained how the escape could possibly have been effected, and why no one appeared before 1804 to show that the Prince had not died.

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LOUIS XVIII (1755–1824). King of France from 1814 to 1824. He was a younger brother of Louis XVI and was born at Versailles, Nov. 17, 1755. He received the title of Count of Provence. In 1771 he married Maria Josephine Louisa, daughter of Victor Amadeus III of Sardinia. After the accession of Louis XVI to the throne he assumed the designation of Monsieur. He became an opponent of every salutary measure of the government. He fled from Paris on the same night with the King (1791), but was more fortunate, for, taking the road by Lille, he reached the Belgian frontier in safety. With his brother, the Count d'Artois, he issued declarations against the Revolutionary cause in France, which had a very unfavorable effect on the fortunes of the King. The two brothers for some time held a court at Coblenz and in 1792, joining with the Prussians under the Duke of Brunswick, led a body of 6000 émigrés across the Rhine. After the death of his brother, Louis XVI, the Count of Provence proclaimed his nephew King of France, as Louis XVII, and on the death of the Prince in 1795 he assumed the title of King. The events of subsequent years compelled him frequently to change his place of abode. He lived by turns in Germany, Courland, Poland, and Sweden, till at last, in 1807, he found a refuge in England and purchased a residence—Hartwell in Buckinghamshire, where his wife died in 1810, and where he remained till the fall of Napoleon opened the way for him to the French throne. He landed at Calais on April 26, 1814, and entered Paris, after 23 years' exile, on May 3, and the nation received the constitutional charter from his hands on June 4. Many popular liberties which had been obtained as the result of the Revolution were guaranteed, and a limited monarchy with popular representative chambers instituted, with, however, a property qualification for the franchise. Nor was the social and economic system of the old régime restored. (See FRANCE.) The conduct of the government, however, was far from being constitutional or liberal. The nobles exercised an influence over the King which led to severe treatment of the adherents of the Empire. (See WHITE TERROR.) Then followed Napoleon's return from Elba, when the King and his family fled from Paris, remained at Ghent till after the battle of Waterloo, and in July, 1815, returned to Paris. Louis issued from Cambrai a proclamation in which he acknowledged his former errors and promised a general amnesty to all except traitors. Again, however, he followed in many things the counsels of the party which detested all the fruits of the Revolution. The party struggle was bitter between the fanatical Royalists on the one hand and those who desired a true parliamentary government on the other. The King succeeded in satisfying neither side, and the struggle was still in progress when this feeble monarch died. The France of the Restoration lent itself to the policy of the Holy Alliance, for the repression of all liberal or radical thought, and the year 1823 witnessed the invasion of Spain by a French army, sent to reëstablish the tyrannical sway of Ferdinand VII.

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LOUIS III THE CHILD (893–911). King of Germany from 900 to 911. He was raised to the throne of Germany soon after the death of his father, Arnulf, by the influence of Archbishop Hatto of Mainz, who governed the country in the name of Louis. Germany was in a wretched condition under his rule, and the Hungarians seized this opportunity to devastate the German lands as far as Thuringia. The Carolingian dynasty in Germany ended with Louis III. Consult Rintelen, "Geschichte Ludwig des Kindes und Konrad I," in *Forschungen zur deutschen Geschichte*, vol. iii (Göttingen, 1864). See CAROLINGIANS.

LOUIS I (Ger. **LUDWIG**) (1753–1830). First Grand Duke of Hesse-Darmstadt, born at Prenzlau, son of the Landgrave Louis IX. After serving for a time in the Russian army he succeeded his father as Landgrave in 1790, received in 1803 the Duchy of Westphalia and part of the old see of Mainz as compensation for his losses on the farther side of the Rhine, and entered the Confederation of the Rhine as Grand Duke in 1806. He joined the allies in 1813 and became a member of the Germanic confederation in 1815. In 1820 he granted a constitution to his people and upon his death was succeeded by his son, Louis II.

LOUIS I, DUKE OF ANJOU (1339–84). A King of Naples, son of John the Good of France. After the Peace of Bretigny in 1360 he was given as a hostage to Edward III of England, but returned to France on parole in 1363 and remained there. He became Governor of Languedoc under Charles V, and fought bravely against the English. In 1380 he became Regent for the incapable Charles VI, and at the instance of the Antipope Clement VII was adopted by Joanna I, Queen of Naples, as her successor. The rival Pope, Urban VI, supported Charles of Durazzo, who succeeded in making good his claim against Louis. See CHARLES III OF NAPLES; JOANNA I.

LOUIS II, DUKE OF ANJOU (1377–1417). An unsuccessful claimant to the throne of Naples. Inheriting a claim from his father, Louis I, he set out for his Kingdom in 1390 and took possession of it, but at the end of about nine years was driven out by Ladislas, son of his father's rival, Charles of Durazzo. About 12 years later Louis determined again to conquer the Kingdom. He won the battle of Roccasecca in 1411, but lost the help of the Pope and retired to France. His daughter, Marie, married Charles VII.

LOUIS III, DUKE OF ANJOU (1403–34). A claimant to the throne of Naples, son of Louis II. He was adopted as her successor by Queen Joanna II. He had a rival in Alfonso V of

Aragon, whom Joanna had adopted and then thrust aside, and the two waged war with each other. Louis died before the Queen.

LOUIS III (1378–1436). An Elector of the Palatinate, son of King Rupert. He acted as Regent during his father's absence in Italy (1401), and succeeded him in 1410. Louis took a prominent part in the election of Sigismund and was long a devoted defender of his ecclesiastical policy, which he advanced at the Council of Constance. Afterward he joined the opposition to the Emperor. He greatly assisted the growth of the University of Heidelberg and left his library to that institution. Louis IV, his son, succeeded him and ruled till 1449. Consult Eberhardt, *Ludwig III., Kurfürst von der Pfalz* (Giessen, 1896).

LOUIS I (Portug. **LUIZ**) (1838–89). A King of Portugal, son of Prince Ferdinand of Saxe-Coburg-Gotha and Maria II da Gloria. He held the titles of Duke of Saxony and Duke of Oporto while Pedro was Crown Prince and King, and succeeded him in 1861. He married Maria Pia, Princess of Savoy and daughter of Victor Emmanuel of Italy, in 1862. Louis attempted to promote various reforms, and in February, 1868, abolished slavery in the Portuguese colonies. He appeared entirely serene when the Republic triumphed in Spain (September, 1868), although he energetically opposed the programmes for establishing an Iberian Republic and absolutely refused to allow his name to appear as a candidate for the throne of Spain (October, 1868, to December, 1869). He tried earnestly to improve the finances of the country by various measures, even voluntarily reducing the civil list. His reign, however, was one of party strife, in a great measure fruitless of results, because of violent ministerial changes. Among the ministers who wielded power were Saldanha, Pereira de Mello, and Castro. In its colonial policy the government showed some vigor. In his leisure moments Louis devoted himself to letters and the fine arts. He translated into Portuguese Shakespeare's *Hamlet*, *Richard III*, and the *Merchant of Venice*, and Homer's *Iliad*. He had also some ability as a painter.

LOUIS the Springer (1042–1123). Landgrave of Thuringia and son of Louis I 'the Bearded,' who founded the Thuringian house. He was a supporter of the Emperor Henry IV until 1085, when he passed to the Opposition. He founded the Wartburg and several cloisters, one of which he entered as a monk towards the end of his life. According to the legend, he fell in love with Adelheid of Saxony, killed her husband, and married her. The murdered man's friends captured him in the Castle Giebichenstein, near Halle, but by a wonderful leap he managed to escape from them and thereby earned his nickname. He was succeeded by his eldest son, Louis, and the latter by his son Louis. Consult Knochenhauer, *Geschichte Thüringens zur Zeit der ersten Landgrafenhauses* (Gotha, 1871).

LOUIS, Henry (1855–). An English mining engineer, born in London and educated at the City of London School and the Royal School of Mines. He had practical experience in iron and steel works in Nova Scotia, at Swansea, and near Edinburgh; in gold mining in South America and West Africa; and in diamond mining in the Transvaal. In 1896 he became professor of mining at Armstrong College, University of Durham. He translated (1907) Schnabel's *Handbook of Metallurgy* and Schmeisser's *Goldfields of Australasia*, and wrote important treatises on gold milling, mineral dressing, the metallurgy of tin and platinum, etc., and the James Forrest lecture before the Institution of Civil Engineers, *Some Unsolved Problems in Metal Mining* (1908).

LOUIS, Order of. A French order with three classes, founded by Louis XIV in 1693 for military service. It was dissolved at the Revolution, was restored by Louis XVIII, and ceased to exist in 1830.

LOUISA, lo͞o-ē′zȧ (Luise Auguste Wilhelmine Amalie), Queen of Prussia. See Luise.

LOUISA, Order of. A Prussian order, founded in 1814 by King Frederick William III in memory of Queen Louisa, and conferred for distinguished patriotism and humanity. Its membership of 100 was limited to Prussian subjects. In 1850 it was revived as a distinction for women who had rendered notable service in the care of the wounded in 1848 and 1849. It was again bestowed for similar services in 1865, 1866, and 1871.

LOUISA ULRICA, lo͞o-ē′zȧ ṳl-rē′kȧ (1720–82). Queen of Sweden, sister of Frederick the Great. She was born in Berlin and married in 1744 the Crown Prince Adolphus Frederick of Sweden, who ascended the throne in 1751. She was a woman of rare intelligence, but was overbearing, and rashly spurred on her feeble husband to assert his power in opposition to the estates of the realm. In 1857 she induced the King to enter the war against Frederick the Great. Through her influence the great botanist Linnæus was enabled to publish his system, and the Academy of Belles-Lettres and History and the Museum at Stockholm were founded.

LOUISBURG, lo͞o′ĭs-bûrg. A town on the Atlantic coast of Cape Breton Island, commanding the entrance to the Gulf of St. Lawrence, a position which gave it great importance during the French and English wars of the eighteenth century. Cape Breton Island was secured to the French by the Peace of Utrecht in 1713, and the French government at enormous expense erected a formidable fortress, inclosing and commanding an excellent harbor. Twenty-five years were spent in completing the work. This post, long the chief stronghold of the French in America, served as a rendezvous for their fleets and privateers and was a source of ever-threatening danger to the New England fishermen on the Banks. So great was this menace that, in 1745, Governor Shirley of Massachusetts was able to induce the Assembly of that Colony to undertake the reduction of the post. A force of some 3600 men (the great majority of whom were from Massachusetts), under the leadership of Col. William Pepperell, escorted by a fleet of 100 New England vessels, was joined by a British squadron under Commodore Warren, and the undertaking was carried to a triumphant conclusion. Louisburg was invested April 30, 1745, and its garrison of 1600 men surrendered on June 17. In 1748, however, by the terms of the Treaty of Aix-la-Chapelle, Louisburg again became the property of France. Ten years later, in 1758, the town was invested by a force of 14,000 men under General Amherst and Admiral Boscawen and captured. Since that time it has been a part of British America. While it was under the French dominion Louisburg was a flourishing centre for the fishing trade. Under English government the place has dwindled into insignificance, and its capacious harbor is used simply as a stopping place for steamships. Besides the histories of Cape Breton, much valuable material relating to the siege of Louisburg has been published in the annual volumes of the Society of Colonial Wars. Consult Sir Adams Archibald, "First Siege and Capture of Louisburg" in *Transactions of the Royal Society of Canada* (Ottawa, 1888), and W. C. H. Wood, *Logs of the Conquest of Canada* (Toronto, 1909).

LOUIS D'OR, lo͞o'ī dôr' (Fr., golden louis). A gold coin which was introduced into France in 1640 and continued to be coined till 1810. Until 1792 the inscription was *Christus regnat vincit imperat;* after that it was *Règne de la loi.* Its milled edges were intended to prevent clipping and paring. The louis d'or ranged in value from about $4 to $4.50, while demilouis and double louis were also frequently issued. Some louis d'or bear special names, chiefly derived from the figure exhibited on the obverse side. In some parts of Germany the larger gold pieces, of five thalers or thereabouts, were often popularly called louis d'or, and the name was also occasionally applied to the French napoléon, or 20-franc piece.

LOUISE, lo͞o'ēz'. An opera by Charpentier (q.v.), first produced in Paris, Feb. 2, 1900; in the United States, Jan. 3, 1908 (New York).

LOUISE OF SAVOY (1476–1531). Duchess of Angoulême, and later Regent of France. She was the daughter of Philip, Duke of Savoy, and was born at Pont d'Ain. At the age of 12 she married Charles of Valois, Count of Angoulême, and became the mother of Marguerite of Angoulême (1492) and of Francis I (1494). Her husband died in 1496. By the decision of the States-General (1506), Francis married Claude, daughter of Louis XII, whom he succeeded in 1515. His mother became Regent during his absence in Italy. When the expedition returned she refrained from any open show of authority, but still molded the King to suit her desires. Her harsh treatment of the Constable de Bourbon (see BOURBON, CHARLES) caused the desertion of that able general to the side of Charles V. She became Regent again on Francis's return to Italy, and after the disaster of Pavia (1525) made an alliance with the Swiss and with Henry VIII, who at first favored the Imperial alliance. She negotiated the Peace of Cambrai with Margaret of Austria in 1529 (the so-called Ladies' Peace). Her Journal has been published in the collection of memoirs. Consult: "Journal de Louise de Savoye, duchesse d'Angoulesme," in *Collection complète des mémoires relatifs à l'histoire de France,* edited by C. B. Pétitot, vol. xvi (Paris, 1819–29); De Maulde, *Louise de Savoie et François I* (ib., 1895); Henri Hauser, "Le journal de Louise de Savoy," in *Revue historique,* vol. lxxxvi (ib., 1904).

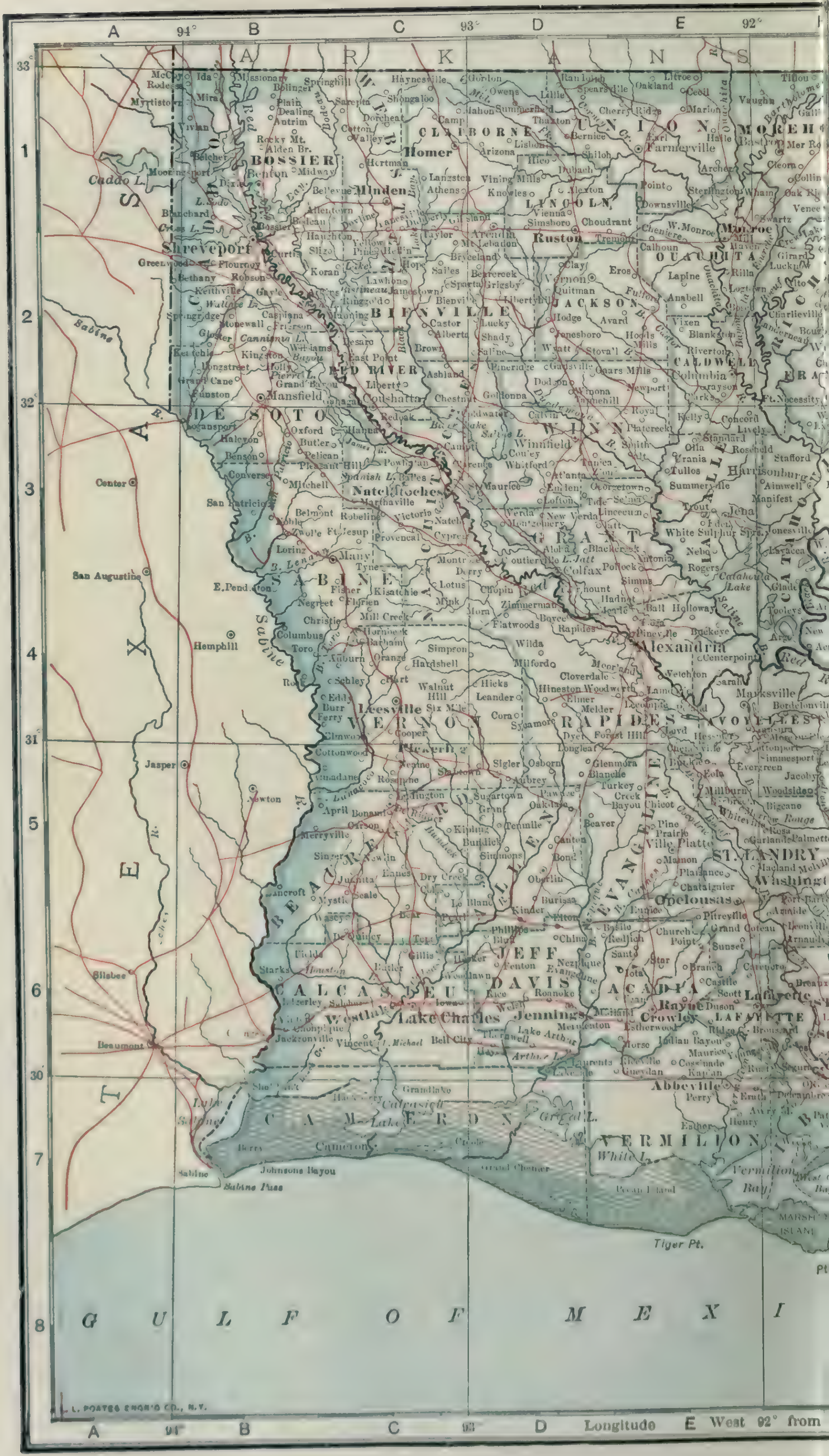
LOUISEVILLE, lo͞o'ĕz'vĭl, or RIVIÈRE DU LOUP, rē'vyâr' dụ lo͞o (en haut) (Map: Quebec, E 4). The capital of Maskinonge County, Quebec, Canada, on Lake St. Peter and the Canadian Pacific Railway, 23 miles west-southwest of Three Rivers by rail. Its manufactures include lumber, foundry and machine-shop products, butter and butter boxes, and shirts. The neighboring St. Léon mineral springs are much frequented as a health resort. Pop., 1901, 1655; 1911, 1675.

LOUIS FREDERICK CHRISTIAN, PRINCE, usually called LOUIS FERDINAND (1772–1806). A Prince of Prussia, son of Prince Ferdinand, a brother of Frederick the Great; an able and brave but eccentric man. He took part in the Rhine campaign of 1792, commanded the vanguard of Hohenlohe's corps in 1806, and despite orders, fought a battle at Saalfeld on Oct. 10, 1806, in which he was killed.

LOUISIADE (lo͞o-ē'zē-äd') **ARCHIPELAGO.** A group of islands at the southeast extremity of British New Guinea, to which it belongs (Map: Australasia, H 4). It consists of three large islands—St. Aignan, Southeast Island, and Rossel, each with an area of from 100 to 300 square miles—and numerous small islets and reefs. The large islands are mountainous, having peaks which rise to a height of over 3000 feet, while the islets are chiefly of coral formation. The group is inhabited by savages of the Papuan and Melanesian races. The islands were discovered by Torres in 1606, and taken by the British in 1888.

LOUISIANA, lo͞o-ē'zē-ä'nȧ *or* -ăn'ȧ (named as a colony in honor of Louis XIV of France). One of the Gulf States of the United States of America, including the delta region of the lower Mississippi River. It lies between parallels 29° and 33° N. and meridians 89° and 94° W. and is bounded on the north by Arkansas and Mississippi, on the east by Mississippi and the Gulf of Mexico, on the south by the Gulf, and on the west by Texas. Its area is 48,506 square miles, of which 3097 are water. Of the water area 1700 square miles are inland lakes; 1060 square miles are landlocked bays, often called lakes; and 540 square miles are river surface.

Topography. Near the Arkansas line, between the Ouachita (Washita) and Red rivers, the hills often rise 300 feet above mean tide, rarely 400 feet above the same datum. Similar or slightly higher elevations are found between the Red and Sabine rivers, especially in the Kisatchie Hills. Elevations of 300 feet are also found along the Mississippi border north of Lake Pontchartrain. The higher portions of the State usually show a finely dissected topography, with a relief rarely exceeding 100 feet. The coastal belts are flat, and intermediate areas, lying roughly between parallels 30° and 31° N., are gently rolling. Of sharp, bare-rock declivities there are few, save in the Kisatchie Hills, Catahoula Bluffs, and in Sicily Island. In the north-central portion of the State there are a few small prairies with a soil decidedly calcareous or saline. In the south, from Acadia Parish westward a broad prairie belt extends into Texas, bounded by the Gulf marshes on the south and by the rolling forest lands of Evangeline and northern Calcasieu parishes on the north. The bottom lands of the Mississippi at the Arkansas line have an elevation of 130 feet above the Gulf; at Natchez, 66 feet; at Baton Rouge, 34 feet; and at New Orleans, 15 feet. The average elevation of the State is only about 75 feet above tide. All the large streams have wide flood plains, those of the Ouachita and Red rivers averaging from 6 to 10 miles, those of the Mississippi from 20 to 60 miles wide. Through these flood plains the rivers meander on a decreasing gradient, constantly depositing their load of silt. This results in building up their beds until the rivers flow, as it were, on the summits of broad, low ridges. From the river margin the land slopes away with a gradient of perhaps 7 feet for the first mile; thereafter about 6 inches to the mile to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CLAIBORNE
UNION
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OUACHITA
JACKSON
BIENVILLE
CALDWELL
RED RIVER
DE SOTO
NATCHITOCHES
WINN
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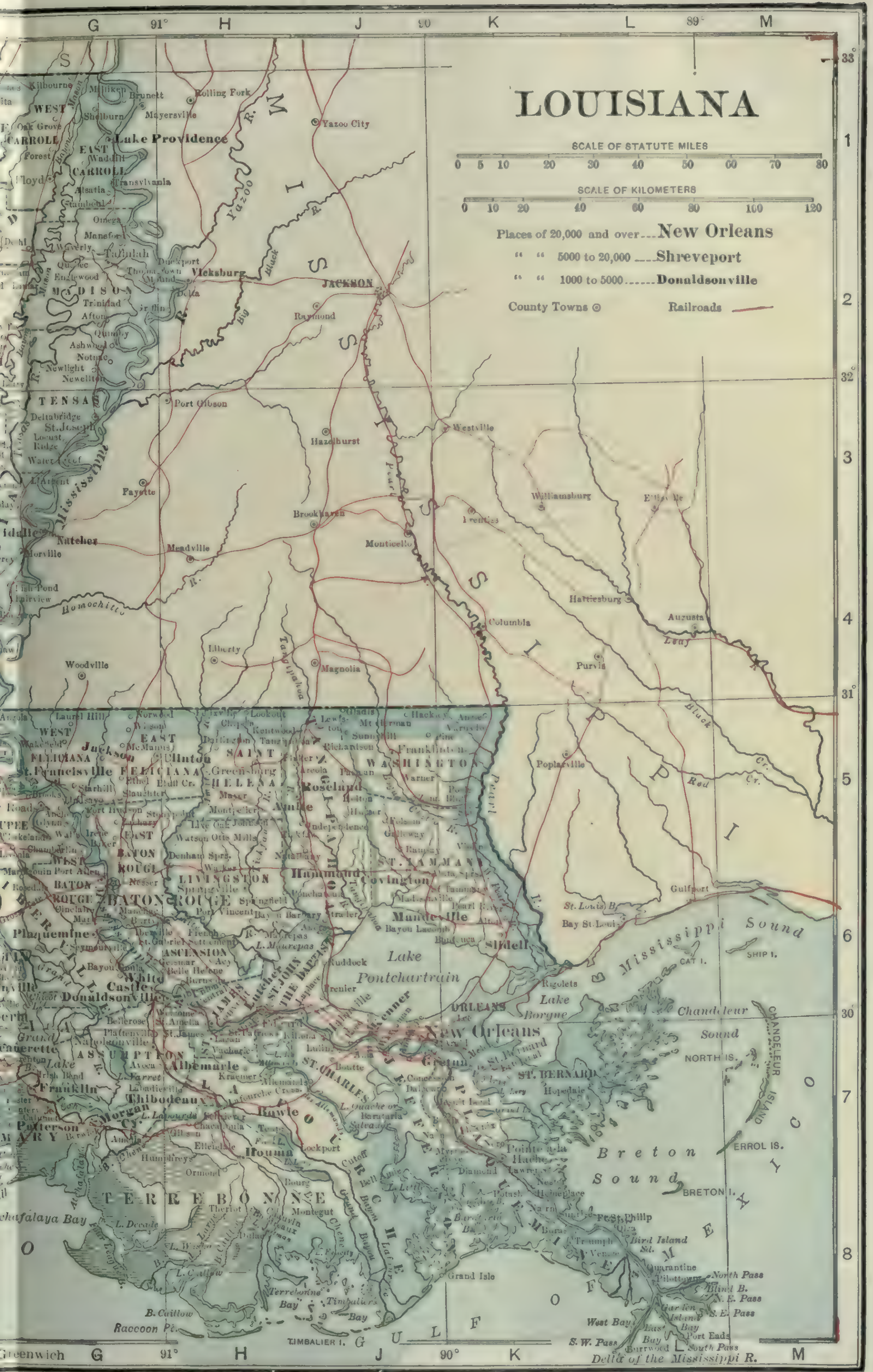
CATAHOULA
GRANT
SABINE
VERNON
RAPIDES
AVOYELLES
BEAUREGARD
ALLEN
EVANGELINE
ST. LANDRY
CALCASIEU
JEFF DAVIS
ACADIA
LAFAYETTE
CAMERON
VERMILION
Shreveport
Minden
Homer
Ruston
Monroe
Farmerville
Mansfield
Coushatta
Natchitoches
Many
Winnfield
Colfax
Alexandria
Marksville
Leesville
Lake Charles
Jennings
Crowley
Opelousas
Lafayette
Abbeville
Cameron
Caddo L.
Sabine
Sabine Pass
Lake Sabine
Calcasieu Lake
Grand L.
White L.
Vermilion Bay
Tiger Pt.
Beaumont
Jasper
Newton
Hemphill
San Augustine
Center
Bilsbee
L. POATES ENGR'G CO., N.Y.
Longitude West 92° from



LOUISIANA

SCALE OF STATUTE MILES
0 5 10 20 30 40 50 60 70 80
SCALE OF KILOMETERS
0 10 20 40 60 80 100 120
Places of 20,000 and over New Orleans
" " 5000 to 20,000 Shreveport
" " 1000 to 5000 Donaldsonville
County Towns ⊙
Railroads
G
91°
H
J
90
K
L
89°
M
33°
32°
31°
30°
1
2
3
4
5
6
7
8
MISSISSIPPI
Yazoo R.
Big Black R.
Pearl R.
Homochitto R.
Tangipahoa
Leaf
Black Cr.
Red Cr.
Mississippi R.
Kilbourne
Milliken
Brunett
Rolling Fork
Mayersville
Yazoo City
WEST CARROLL
Shelburn
Oak Grove
Lake Providence
Forest
EAST CARROLL
Floyd
Transylvania
Alsatia
Omega
Manefort
Waverly
Tallulah
Duckport
Vicksburg
JACKSON
MADISON
Delta
Raymond
Trinidad
Afton
Quimby
Ashwood
Newlight
Newellton
TENSAS
Port Gibson
Deltabridge
St. Joseph
Locust Ridge
Waterproof
Hazlehurst
Westville
Fayette
Brookhaven
Williamsburg
Ellisville
Prentiss
Monticello
Natchez
Vidalia
Meadville
Fish Pond
Fairview
Hattiesburg
Columbia
Augusta
Liberty
Woodville
Magnolia
Purvis
Angola
Laurel Hill
Norwood
Lookout
Osyka
Kentwood
Hackley
Angie
WEST FELICIANA
St. Francisville
EAST FELICIANA
Jackson
Clinton
SAINT HELENA
Greensburg
Amite
Roseland
WASHINGTON
Franklinton
Poplarville
Slaughter
Montpelier
Independence
EAST BATON ROUGE
WEST BATON ROUGE
Port Allen
Baton Rouge
LIVINGSTON
Springville
Hammond
ST. TAMMANY
Covington
Mandeville
Slidell
Pearl River
Gulfport
St. Louis B.
Bay St. Louis
Mississippi Sound
CAT I.
SHIP I.
Plaquemine
ASCENSION
Donaldsonville
White Castle
L. Maurepas
Lake Pontchartrain
ST. JOHN THE BAPTIST
ST. JAMES
Ruddock
Frenier
Kenner
ORLEANS
New Orleans
Rigolets
Lake Borgne
Chandeleur Sound
CHANDELEUR ISLAND
NORTH IS.
ST. BERNARD
Hopedale
Gretna
ASSUMPTION
Napoleonville
Albemarle
LAFOURCHE
Thibodeaux
Franklin
Morgan Cy.
Patterson
ST. MARY
Berwick
Houma
Raceland
ST. CHARLES
JEFFERSON
PLAQUEMINES
TERREBONNE
Lockport
Cut Off
Montegut
Theriot
Atchafalaya Bay
L. Decade
Raccoon Pt.
B. Caillou
Terrebonne Bay
Timbalier Bay
TIMBALIER I.
Grand Isle
L. Salvador
Barataria Bay
Pointe a la Hache
Breton Sound
BRETON I.
ERROL IS.
Ft. St. Philip
Bird Island
Quarantine
Pilottown
North Pass
N. E. Pass
S. E. Pass
Port Eads
South Pass
S. W. Pass
West Bay
East Bay
Garden Island Bay
Delta of the Mississippi R.
GULF OF MEXICO
Greenwich

the marginal bayous of the flood plain. These river lands furnish a soil of inexhaustible fertility and are largely utilized by plantations of sugar cane, cotton, and corn. They are in part protected from overflow by artificial banks or levees, there being over 1500 miles of such levees in the State. Occasionally in times of great floods portions of these levees give way, forming crevasses and allowing the waters to inundate the surrounding lands with disastrous results. The Gulf border parishes are largely made up of marshlands, with here and there ancient shell-beach ridges, salt "islands" and narrow dry strips along the watercourses. To the west of the delta these marshlands average 30 miles in width, and in the delta they may have over twice that width. These lowlands and the river flood plains constitute nearly one-half the area of the State. The principal rivers are the Mississippi, which flows 600 miles within the State and along its borders, the Red, Ouachita, Sabine, Atchafalaya, and Pearl. The Mississippi and Red rivers may be termed generally navigable throughout the year, while others become shoal in dry seasons, especially in late fall.

The lakes are of three classes: first, those called lakes but really saline bays along the coast—Pontchartrain, Borgne, Maurepas, Sabine, etc.; second, a host of crescent or "oxbow" lakes which are the unfilled portions of amputated river channels. The third include various temporary expansions of waters tributary to Red River, above Alexandria—Grass, Black, Bistineau, Cross, and Ferry lakes. These last owe their origin to the clogging of the main channel by the so-called "raft," or log jam, during the past two or three centuries. The raft occasionally had a length of 160 miles, increasing above by addition of woody débris, contracting below by the decay and final disappearance of such matter. Hence there was always an apparently upward movement noticeable in this raft, ranging from ⅕ mile to 5 miles annually. As raft conditions approached the mouth of a tributary stream the current was checked and deposition ensued. Streams so dammed formed lakes, flooding their bordering lowlands, killing trees and vegetation in general. In some of the last-formed lakes, Cross and Ferry lakes, the decaying trunks and stumps of preraft forests may still be seen protruding above the water. Since the removal of the raft artificially in 1873 the bed of Red River, e.g., about Shreveport, has rapidly lowered and the tributary streams are now rapidly excavating the dams at their mouths and lowering and draining the lakes.

At the mouth of the Mississippi the delta is rapidly advancing into the Gulf, depositing in excess of the waste of the waves and the general sinking of the whole mass. Especially is this the case in the immediate vicinity of the mouth of the river, the passes. Here the river, which above has a depth of over 100 feet, is shoaled by bars to 12 feet. The principle of compelling the passes to deepen their own channels by jettying was first successfully applied by Capt. J. B. Eads to South Pass (1875), where a 30-foot depth is constantly maintained. Southwest Pass has since been similarly deepened. See JETTY; MISSISSIPPI RIVER.

Geology. Louisiana, east Arkansas, west Tennessee, and Mississippi are largely made up of unconsolidated sands and clays lying in the Mississippi trough or embayment of the coastal plain, which in Cretaceous times extended to southern Illinois. Throughout the later Cretaceous, Tertiary, and Quaternary this embayment filled in laterally and from the north, till finally at present the delta region actually protrudes into the Gulf. There is therefore, in general, a southeasterly or southerly dip observable in nearly all the deposits of the State. Hence in traveling southeasterly across the State one passes over the outcropping margins of beds ranging in age from the Sabine Eocene to those of modern times. The Eocene beds in the northwest portion of the State (Sabine and Midway) have a thickness of about 600 feet, the Upper Eocene beds scarcely less than 2000 feet, the Oligocene and Miocene and Pliocene at least 4000 feet, while the Quaternary beds of the coast average no less than 2000 feet thick. A local uplift involving about five of the northwest parishes of the State has brought the Upper Cretaceous strata to within 600 feet of the surface for 25 miles to the northwest and 40 miles to the southeast of Shreveport. In various places in this uplifted area (Sabine Uplift) there are extensive oil and gas fields. Such hydrocarbons are derived here from various Cretaceous strata, as is shown below.

		DEPTH IN FEET	
Eocene Tertiary	Sabine	0–400	Sands and clay
	Midway	400–600	Black clay
Upper Cretaceous	Arkadelphia clay	600–800	
	Natchitoches sands	800–1150	Shreveport or Caddo gas sands
	Marlbrook	1150–1300	Sand and clay
	Austin chalk	1300–1600	Some light oil
	Eagleford clay	1800–2200	Oil and gas. Most productive of the field

Just to the east of this uplift, in Bienville and Winn parishes, local salt domes a mile or two in diameter have actually brought the Upper Cretaceous to the surface. About a salt core, gypsum and cavernous rock of secondary origin are found; likewise local pockets of oil and gas. Similar salt uplifts in the Gulf border region have formed similar structures in Quaternary deposits. In some the central salt masses have arisen close enough to the surface to be profitably mined—Avery's and Weeks's mines. In others the superincumbent beds constitute fine reservoirs for the concentration of oil. The coastal oil fields are all of this type. In one instance, at Sulphur, in Calcasieu Parish, the porous, secondary calcareous rocks are replete with native sulphur. It is here that the greatest sulphur industry of this continent is located.

From the general stratigraphic and topographic features enumerated above one would expect to find artesian water in the lower areas of the State. Along the D'Arbonne and Ouachita rivers from Claiborne to Ouachita parishes and along Red River in Natchitoches Parish the Sabine Eocene sands furnish a fair supply of such water. But for quality of water no beds can compare with the fine-grained, light Grand Gulf sandstones in Catahoula and Rapides parishes. Along the Gulf border, for 30 miles inland, west of the delta, artesian water of fair quality is found in Quaternary sand and gravel. Similar water is obtained north of Lake Pontchartrain and westward to Baton Rouge. In the delta and flood plains of the Mississippi underground waters are not generally potable. Water for household purposes is usually obtained by catching and storing rain water from the roofs of the houses.

Climate. The State enjoys a semitropical climate, and the proximity to the Gulf makes its climate remarkably equable. The cyclonic storms of temperate latitudes travel for the most part to the west and north, making the prevailing winds south and southwest, so carrying the tempering influence of the Gulf over the State for the most of the year. Occasional anticyclonic areas, however, bring north and northwest winds, varying the humidity and temperature widely. The average temperature for January is 60° F. in the delta and 45° F. at Shreveport. The absolute minimum temperature brings zero F. to the northwest corner of the State, thus giving a range of over 100° in temperature. The earliest killing frost comes on the average to the latitude of Shreveport November 1, to the middle of the State November 15, to New Orleans December 1. The average date of the latest hard frost is February 1 for the latitude of Baton Rouge and March 1 for Shreveport, thus leaving the State on the average nine months free from frost. The precipitation exceeds 60 inches in the delta region, falling to 50 inches in the northern part. It is quite evenly distributed throughout the year. New Orleans shows a maximum in June, July, and August and a minimum in October, while Shreveport has a slighter maximum in April and a lower minimum in August. Rain falls on the average 105 days in the year, over an area extending from Shreveport to Vicksburg, while 100 days is the average for the rest of the State. The sky is clouded 50 per cent of the winter season and 40 per cent of the summer.

The climatic conditions invite a luxuriant vegetation, in which most of the warm temperate species are found, and in addition a large number of subtropical species, both herbaceous and arborescent. The swamps are filled with cypress trees, making a very valuable source of lumber. Many varieties of oak, including the live oak, as well as the sweet gum, tulip, black walnut, long-leaf pine, short-leaf pine, and cedar, abound, and trees are draped in Spanish moss. Roses, magnolias, oleander, and jasmine grow in profusion, and the list of fruit trees includes the orange, lemon, olive, fig, peach, and plum.

For flora and fauna, see these sections in the article UNITED STATES.

Soils. The alluvial bottom lands of the Mississippi and Red rivers cover about one-third of the State's area, very little of it rising more than 50 feet above tide level. Fine sandy loams and loam soils occur at the higher elevation along the principal streams, and heavy silty clays in the lower portions. These soils are very fertile where drainage has been perfected. The rolling and somewhat hilly coastal plain occupies the northern, northwestern, and eastern portions and borders the alluvial bottoms. A good part of this is still forested. The soils consist of sands and sandy loams, with a little clay. The southwest is covered by the low, undulating portion of the coastal plain, partly timbered, but consisting mostly of prairies, the soil of which is a gray silty loam which has been irrigated for the production of rice.

Mining. Louisiana has two important mineral products, sulphur and petroleum. In the production of the former it stands first, producing most of the sulphur mined in the United States. The first deposits were discovered in Calcasieu Parish in 1865 while borings for petroleum were being carried on. The production of sulphur on a large scale began in 1904 with the adoption of the Frasch process for the recovery of sulphur from beds underlying a heavy cover of quicksand. (See FRASCH, HERMAN; SULPHUR.) From 1904 to 1913 approximately 2,330,000 tons of refined sulphur were recovered by the Union Sulphur Company of Sulphur City, the only place in which sulphur is mined on a large scale in the State. The production in 1913 cannot be given on account of divulging individual outputs, but of the total output of 311,590 tons, valued at $5,479,849, for the United States, almost the entire quantity came from Louisiana. Sulphur, however, is not the chief source of the mineral wealth of Louisiana. Two years before the development of the sulphur resources at Sulphur City prospecting for petroleum resulted in the discovery and development of several oil pools in the vicinity of Jennings, La. This followed the sensational strike of oil at Beaumont, Texas, in 1901. Since that time productive areas have been developed in several portions of the State, and in 1913 Louisiana ranked sixth among the States in the quantity of oil produced. In 1913 the quantity produced amounted to 12,498,828 barrels, valued at $12,255,931. The larger part of the petroleum is obtained from the Caddo district, near Shreveport. The combined value of the petroleum and sulphur products of Louisiana forms nearly 90 per cent of the State's total mineral output. In addition to petroleum and sulphur, rock salt is mined in considerable quantities. In this mineral the State ranks second. The development of natural gas followed that of petroleum, and it is believed that the State is underlain by one of the greatest gas fields in the United States. The production in 1913 was over $2,000,000.

The clay products, exclusive of pottery, were valued in 1913, at $638,491. The gravel pits yielded, in 1913, 878,943 tons, valued at $262,840. The only other mineral products of any importance are mineral waters and stone. The total value of the mineral products of Louisiana in 1913 was $21,011,828.

Agriculture. Of an approximate land area of 29,061,760 acres in 1910, more than one-third, 10,439,481 acres, was in farms. The average acres per farm were 86.6 in 1910. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, in 1910, was $301,220,988.

Of the total number of all farms (120,546) in 1910, 53,939 were operated by owners and managers, and 66,607 by tenants. In that year 8,315,160 acres were owned, managed, or leased by white farmers and 2,124,321 acres by colored. The acreage owned by white farmers was 5,931,425, and by colored 744,250. Five-sixths of all the farms in the State were between 10 and 174 acres in size. The native white farmers in 1910 numbered 63,236, foreign-born white farmers 2431, and negro and other nonwhite farmers 54,879. Of the foreign-born white farmers the larger number were born in Italy.

The acreage, value, and production of the principal crops in 1914 are given in the following table. The figures are estimates of the United States Department of Agriculture.

The leading crops in the order of their importance are corn, cotton, rice, hay and forage, and sweet potatoes and yams. The area devoted to sugar cane in Louisiana in 1913 was about 300,000 acres. The average production of sugar is about 160 pounds per ton of cane ground and about 3000 pounds of sugar per acre. The total production of sugar in 1912 was about 720,000,000 pounds, and this was accompanied by a production of several million gallons of molasses. The largest quantity of sugar was produced in St. Mary Parish. In addition to the regular sugar crop an enormous quantity of sirup is manufactured on a small scale by the farmers.

PRODUCTS	Acreage	Prod. bu.	Value
Corn	2,000,000	38,600,000	$28,950,000
Hay	200,000	* 380,000	4,560,000
Tobacco	700,000	† 280,000	98,000
Rice	336,500	18,802,000	10,046,000
Cotton	1,360,000	‡ 460,000	15,184,000
Sweet potatoes and yams	59,000	5,133,000	3,285,000
Oats	70,000	1,610,000	1,014,000

* Tons. † Pounds. ‡ Bales of 500 pounds gross weight.

Rice has been grown in Louisiana for more than a century. The total acreage reported and irrigated for the growing of rice in 1909 was 380,200, and the parish for which the largest acreage was reported as irrigated for rice growing was Calcasieu. Most of the water is supplied from streams, and along the Mississippi a considerable acreage, lying below the level of the river, is supplied by siphoning over the levees. The average yield of irrigated rice was, in 1910, 34.6 bushels per acre and the average value was $25.70 per acre. The total acreage for potatoes and other vegetables in 1909 was 114,829 and the value of the product was $6,282,904. Excluding potatoes and sweet potatoes and yams the acreage of vegetables was 38,221 and their value $3,001,000. There were produced, in 1909, 392,607 bushels of orchard fruits, valued at $314,027. The most important in quantity and value were peaches and nectarines. Of the tropical fruits the only important ones grown are oranges and figs. The orange product in 1909 was 149,979 boxes, valued at $222,339. There were produced 2,025,308 pounds of figs, valued at $87,099. Other tropical fruits produced in small quantities are grapefruit, lemons, tangerines, and mandarins. The grapes grown in 1910 amounted to 106,595 pounds. The only important small fruit grown on a considerable scale is the strawberry. The total value of small fruits in 1909 was $486,988.

Live Stock and Dairy Products. The total value of all animals on farms in 1910 was $43,314,683. The estimated figures for Jan. 1, 1915, are given by the United States Department of Agriculture as follows: cattle other than milch cows, 448,000, valued at $7,347,000; milch cows, 268,000, valued at $9,648,000; horses, 191,000, valued at $15,853,000; mules, 132,000, valued at $16,500,000; sheep, 180,000, valued at $396,000; swine, 1,412,000, valued at $10,872,000. The fowls of all kinds in 1910 were valued at $1,326,614. The milk produced in 1909 was 32,702,130 gallons and the total value of milk, cream, and butter fat sold, and butter and cheese made, was $2,761,380.

Fisheries. Louisiana is one of the most important of the Gulf States in the total value of its fisheries. The oyster fisheries are the most valuable on the United States coast south of Virginia. In 1908, the latest year for which complete statistics are available, there were taken 3,073,200 bushels of oysters, valued at $719,700 for market purposes. Next in point of value was shrimp, of which 8,581,500 pounds, valued at $212,500, were taken. Other important fish are catfish, trout, channel bass, croaker, crabs, and terrapin. The total value of the product of the fisheries in 1908 was $1,568,800. The number of independent fishermen engaged in the fisheries in that year was 2970, and there were 4913 vessels, valued at $699,000, engaged in fishing. Alligators, formerly very numerous, are becoming rare.

Forest Products.—Louisiana is rich in forest products, which have been comparatively unexploited until the beginning of the twentieth century. Since 1904 the State has occupied first place in the yellow-pine industry, and since 1905 has been surpassed in total lumber production only by the State of Washington. In quantity of standing timber Louisiana is outranked only by the Pacific coast States and Idaho. Large bodies of timber are owned by northern furniture, automobile, and sewing-machine factories and other wood-using industries, which will cut the oak, ash, and red gum to supply their own needs.

The timber holdings, as reported by the United States Bureau of Corporations in 1913, approximated 12,476,000 acres, and the estimated amount of standing timber suitable for manufacture into lumber was: pine of all kinds, 67,700 million board feet; cypress, 15,700 million board feet; and various hard woods, 36,400 million board feet.

The output of lumber in 1909 was: yellow pine, 2,736,756 thousand board feet; cypress, 608,854 thousand board feet; and hard woods, such as cottonwood, red gum, tupelo, ash, and hickory, 206,308 thousand board feet. There were also manufactured 377,708,000 laths, 757,868,000 shingles, together with large quantities of barrel staves and headings and veneer. The farms produced miscellaneous forest products valued at $3,584,340.

The naval-stores industry is less important in Louisiana than in any other long-leaf-pine State except Texas, but is gradually moving westward from Alabama and Mississippi. There were produced, in 1909, 1,231,254 gallons of turpentine, valued at $592,641, and of rosin, 139,486 barrels of 280 pounds each, valued at $533,306.

Manufactures. From 1849 to 1909 the value of Louisiana manufactures increased at a somewhat greater rate than the value of the manufactures of the United States as a whole. A large proportion of the raw materials used in the manufactures is furnished by the forests of the State and by its sugar-cane, cotton, and rice fields. The difficulty of obtaining a sufficient supply of fuel greatly retarded the early development of manufactures, but the opening of short canals and improvements of waterways and railroad facilities have materially reduced transportation costs. The rapid development of the oil fields of the South, particularly in Texas, has afforded a cheap substitute for coal and given an increased impetus to manufactures of Louisiana.

In 1849 the total value of the manufacturing industries, including the products of the neighborhood and hand industries, amounted to only $6,779,000, while in 1909, exclusive of the value of all the products of the neighborhood and hand industries, it reached $223,949,000, representing an increase of over thirty-two fold. During the same period population increased only a little more than twofold. The value of manufactured products per capita of the total population increased from $13 in 1849 to $135 in 1909. Louisiana ranked twenty-fourth in 1849 among the States in respect to gross value of products, but by 1909 it had advanced to nineteenth place. The accompanying table gives the most important data relating to the industries in 1909, in comparison with 1904:

COMPARATIVE SUMMARY FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1909	2,516	86,563	76,165	$221,816	$33,386	$223,949	$89,084
	1904	2,091	63,735	55,859	150,811	25,316	186,380	69,345
Bags, other than paper	1909	6	538	474	2,352	158	5,352	280
	1904	6	422	370	1,145	117	4,076	432
Bread and other bakery products	1909	289	1,744	1,289	1,829	669	4,620	1,917
	1904	236	1,032	742	787	374	2,686	1,013
Copper, tin, and sheet-iron products	1909	66	1,200	979	4,107	503	2,899	1,169
	1904	30	382	291	339	185	796	421
Foundry and machine-shop products	1909	83	1,573	1,314	3,710	812	2,998	1,546
	1904	72	1,899	1,659	4,048	957	3,261	1,989
Liquors, malt	1909	9	620	512	5,656	384	3,573	2,536
	1904	9	373	318	3,105	244	2,287	1,690
Lumber and timber products	1909	702	49,535	46,072	88,973	20,033	62,838	39,682
	1904	471	30,161	27,877	39,573	12,827	38,371	27,986
Oil, cottonseed, and cake	1909	43	1,165	894	7,164	318	13,085	1,517
	1904	51	1,916	1,605	8,687	561	13,188	1,711
Printing and publishing	1909	268	2,461	1,544	2,996	1,061	3,823	2,810
	1904	240	2,035	1,313	2,121	836	3,184	2,442
Rice, cleaning and polishing	1909	37	960	693	8,385	327	12,529	1,558
	1904	43	1,167	923	6,138	400	10,718	1,745
Sugar and molasses and sugar refining, not including beet sugar	1909	209	6,400	5,093	50,868	2,439	63,775	11,473
	1904	251	7,100	5,815	54,872	3,166	73,787	14,279

In 1909 Louisiana ranked second in the Union in the manufacture and refining of sugar and the manufacture of molasses, the State's output constituting 22.8 per cent of the total value of these products. This is its most important industry. The manufacture of cane sugar in the United States is confined almost exclusively to Louisiana, all but six of the establishments reported for this industry at the census of 1909 being located in that State. The total quantity of cane treated in mills manufacturing sugar in 1909 was 4,471,921 tons, which produced 325,497 tons of refined sugar, 321,819 tons of vacuum-pan sugar, 271,822 tons of first-strike sugar, 41,335 tons of second-strike sugar, and 8662 tons of third-strike sugar. The molasses made amounted to 24,342,555 gallons. There were in addition 942,997 gallons of sirup. The Tariff Bill of 1913 made radical changes in the duties on sugar. By the terms of this law the duty will be one cent per pound until May 1, 1916, except on sugar from Cuba, which will be four-fifths of a cent per pound. After May 1, 1916, sugar will be free. The cane-sugar producers of Louisiana vigorously opposed the lowering of the duties on sugar and emphasized their dependence on the tariff. Presumably the admission of sugar free of duty after 1916 will bring about great changes in the sugar industry of the State, and after the enactment of the law many producers of sugar cane made preparations either to sell their land or to devote it to growing other agricultural products.

The industry connected with the lumber and timber products ranks second in importance. There are more establishments in this line of manufacture than in any other one industry. The manufacture of oil and cottonseed and cake ranks third.

Louisiana is far ahead in the cleaning and polishing of rice, containing, in 1909, 37 of the 71 establishments in the United States engaged in this industry. Another important industry is the manufacture of bags other than paper bags for containing cottonseed, cottonseed meal, rice, and fertilizers.

Of the total number of wage earners in 1910, 71,127 were males and 5038 females. The wage earners under 16 years of age numbered 1539. The prevailing hours of labor for the great majority of wage earners ranged from 60 to 72 a week, or from 10 to 12 a day.

New Orleans, Alexandria, Baton Rouge, Lake Charles, Monroe, and Shreveport contained, in 1909, 25 per cent of the total population of the State and produced 39.2 per cent of the total value of its manufactures. There were in New Orleans 17,186 wage earners, and the value of the products of that city was $78,794,030. See articles on the individual cities for further information.

Transportation. Louisiana has a greater mileage of navigable streams than any other State in the Union. Thus competition with the railroads of the State is afforded and has resulted in lower railroad rates than in many other States. A canal constructed from the Mississippi River to Lake Borgne greatly shortens the passage from New Orleans to the Gulf. Railroad development has been slow. There were in 1880 only 652 miles of track, but this was increased to 1739 in 1890, 2801 in 1900, and to a total trackage of 5233 in 1913. Of this, 3889 miles were main-line single track and 1343 were branches and spurs. Railways having the greatest mileage of main line and branches are the Southern Pacific, 622; St. Louis, Iron Mountain, and Southern, 515; Texas and Pacific, 721; Louisiana Railway and Navigation Company, 342; New Orleans, Texas, and Mexico, 238; Louisiana and Arkansas, 198; Kansas City Southern 245; Queen and Crescent Route, 213; Illinois Central and Yazoo and Mississippi Valley, 418; Chicago, Rock Island, and Pacific, 186. The State has a railroad commission, which has also oversight of water routes. It has control of railway rates within the State. There are three railway-commission districts, and one commissioner is elected from each district. The total mileage of electric railways in 1912 was 285. There were 15 companies operating electric railways in that year. For improvements relating to the Mississippi River, see that title.

Banking. The State enacted an important banking law in 1842, which required a specie reserve equal to one-third of all its liabilities to the public. The remaining two-thirds was to be covered by commercial paper maturing in 90 days. The banks were to be examined by a board of State officers at least once in three months. Furthermore, the bank directors were individually held liable for all loans and investments made in violation of the law, unless it could be proved that they had voted against such investments in session. The law was very successful in its operation. The State in 1860 ranked fourth in amount of banking capital and second in specie holdings. In requiring a definite amount of specie to be kept in reserve the act marked a new era in banking. This, with other of its more important provisions, served as a foundation for the systems established by other States. The banks of New Orleans are noteworthy for the honorable way in which they met their Northern obligations at the outbreak of the Civil War. Sept. 28, 1914, there were 32 national banks in the State, whose loans aggregated $34,100,137.49; cash and sight exchange, $1,063,708.96; capital, $7,220,000; surplus, $11,651,710; circulation, $7,081,785; and deposits, $31,497,277.84. On June 30, 1914, there were 184 State banks with loans and discounts (not including those on real estate and collateral security) aggregating $31,177,252.95; cash, $1,663,561.07; capital $6,185,300; surplus fund, $2,850,159.36; and deposits, $30,809,953.50.

Government. A new constitution was adopted at a convention held in 1913, replacing a constitution adopted in 1898. Propositions for amendments to the constitution may be made by the General Assembly at any session. If two-thirds of all the members elected to each house concur such amendments are submitted to the people, and if a majority voting approve, such amendments become a part of the constitution. When several amendments are submitted at the same time they shall be so submitted as to enable the electors to vote on each amendment separately.

Legislative.—The legislative power is vested in a General Assembly, which consists of a Senate and House of Representatives. Representation in the House of Representatives is based upon population. Each parish and each ward of the city of New Orleans has at least one Representative, but the number of Representatives shall not exceed 120. The number of Senators must not exceed 41 or be less than 36, and they are apportioned among the senatorial districts according to the total population contained in the several districts. The General Assembly holds biennial sessions limited to 60 days, dating from the second Monday in May, 1914.

Executive.—The executive department consists of a Governor, Lieutenant Governor, Auditor, Treasurer, and Secretary of State. The supreme executive power is vested in the Governor. He holds office during four years and must be at least 30 years of age at the time of his election. The Lieutenant Governor is ex officio President of the Senate, but has only a casting vote therein. The Treasurer, Auditor, and Secretary of State are elected for a term of four years. The Treasurer is not eligible as his own immediate successor. The Secretary of State is ex officio Insurance Commissioner, Commissioner of Corporations, Commissioner of Election, and Commissioner of Public Libraries.

Judiciary.—The judicial power is vested in the supreme court, courts of appeal, district courts, justices of the peace, and in such other courts as may be created by the Legislature. The supreme court is composed of one chief justice and four associate justices, who are elected for terms of 12 years. The justices of the supreme court must be over 35 years of age and must have practiced law in the State for 10 years preceding their election or appointment. The State is divided into four supreme-court districts, and the court must always be composed of justices elected from these districts. There is an attorney-general, who is elected for a term of four years. The courts of appeals consist of three judges each. The judges of these courts must have practiced in the State for six years prior to their election. They serve for a term of eight years. The State is divided into not less than 20 or more than 22 judicial districts, each presided over by a district judge who is elected by a plurality of the qualified voters of their respective districts and serves for a term of four years. The constitution of 1913 created a juvenile court for the parish of Orleans and made provision for the establishment of other such courts throughout the State. New Orleans has a separate court of appeals designated as the court of appeals for the parish of Orleans. This is composed of three judges.

Law.—The legal system of Louisiana occupies a rather unique position. It is the only one in the United States not based on the English common law. After the purchase of Louisiana by the United States in 1803, the Spanish Code continued to be used in the territory now composing the State of Louisiana. The only alteration that the change of sovereignty made was the addition of the Anglo-Saxon jury system to the Spanish Code. It has always been the policy of the American government to leave to the people all questions of legal changes, in so far as they do not conflict with the Constitution and customary American legal procedures. After the promulgation of the Code Napoléon in France, its civil code was incorporated into the laws of Louisiana. So to-day we find an admixture of Latin and English law. The civil system is almost entirely Latin, while the criminal, commercial, and corporation systems are almost entirely English.

Suffrage and Elections. Every male citizen of Louisiana and of the United States, native born or naturalized, not less than 21 years of age, is entitled to vote; provided, first, that he shall have been an actual bona fide resident of the State for two years, of the parish one year, and of the precinct in which he offers to vote six months next preceding the election; second, that he shall have been, at the time he offers to vote, legally enrolled as a registered voter on his personal application; third, that he shall be able to read and write and shall demonstrate his ability to do so when he applies for registration by making an application under oath in the English language or his mother tongue; fourth, that if he be not able to read and write he shall at the time he offers to register be the bona fide owner of property valued at not less than $300. No person less than 60 years of age shall be permitted to vote at any election in the State who shall not have paid on or before December 31 of each year, for the two years preceding the year in which he offers to vote, a poll tax of $1 per annum. Any person who shall pay the poll tax of another or advance the money for that purpose in order to influence his vote shall be guilty of bribery. The general State election is held once every four years on the Tuesday next following the third Monday in April. Parochial elections, except in the city of New Orleans, are held on the same day as the general State election, and not oftener than once in four years. In the city of New Orleans parochial and municipal elections are held on the Tuesday following the first Monday in November, 1916, and of every fourth year thereafter. A primary election law governing primary elections was passed by the Legislature of 1906. By this Act the majority party nominations must be made by primary election. Candidates for the nomination of United States Senator, Congressman, Governor, railroad commissioner, judge of the supreme court, and other State offices, must at the time of filing such a notice deposit with the Secretary of State the sum of $250. This deposit is to be returned on promulgation of the returns if the candidate is shown to receive at least 10 per cent of the total vote cast for the office for which he was a candidate. In case any candidate fails to receive a majority of the votes cast for the office for which he is a candidate, a second primary election shall be held, with the same election officers, four weeks from the date of the first primary. At this election no one can be a candidate except the two persons who receive the highest number of votes at the first primary election.

Local and Municipal Government. The unit of local government in the State is the parish, which has exactly the same meaning as county in other States. The General Assembly may establish and organize new parishes, but no such parish shall contain less than 625 square miles nor less than 7000 inhabitants. The general law for commission government applies to towns above 2500 inhabitants and cities, except New Orleans, above 5000.

Other Constitutional and Statutory Provisions. The State provides pensions for Confederate soldiers. A child-labor law was passed by the Legislature of 1908. Gambling on horse racing is prohibited. The selling or giving away of cocaine is forbidden. The Legislature of 1912 passed measures prohibiting lobbying and also enacted a corrupt-practices act. An Employers' Liability Act was passed by the General Assembly in 1914. The sale of liquor is under a regulation law known as the Gay-Shattuck Law. In 1913, about half the State was under "no license," but only two cities (Lake Charles and Shreveport) with 5000 inhabitants or more were included.

Finance. The report of the State Treasurer for the fiscal year 1913 showed a balance in the State Treasury on Jan. 1, 1912, of $850,025. The total receipts for 1913 amounted to $8,203,465 and the expenditures were $7,365,208, leaving a balance on hand on Dec. 31, 1913, of $1,062,174. The bonded debt of the State on Jan. 31, 1914, was $11,108,300. This matured on Jan. 1, 1914, and the Constitutional Convention held in 1913 adopted a public-debt ordinance providing for the payment of this debt. Provision was made for issuing serial bonds for a period not exceeding 51 years, and bearing interest of not more than 4½ per cent, in an amount sufficient to realize the sum necessary to settle or refund the indebtedness, except $530,930 due the Free School Fund and $9900 held for exchange under Act of 1892. Beginning with Jan. 1, 1914, and until the obligations are paid, there was levied on all property on which general State taxes were at that time levied, an annual tax of one and three-twentieths mills on the dollar of assessed valuation, which tax was included as a part of the State tax of six mills also authorized by the constitution to be levied for general purposes. The net proceeds of this tax are to be paid into the State Treasury and credited to a separate account known as the State Bond and Interest Tax Fund. This fund is to be devoted annually, first, to the payment of interest as it accrues on the serial bonds and temporary refunding bonds; second, to the payment of proper expenses of the board of liquidation of the State debt; third, to the payment or purchase of the temporary refunding bonds and serial bonds issued. The per capita debt of the State decreased steadily from $13.52 in 1892 to $7.89 in 1912.

Militia. In 1910 there were 338,343 males of militia age. In 1913, the organized militia numbered 1142, consisting of 60 officers and 1082 enlisted men.

Population. Growth of population is shown in the following: 1810, 76,566; 1820, 153,407; 1830, 215,739; 1840, 352,411; 1850, 517,762; 1860, 708,002; 1870, 726,915; 1880, 939,946; 1890, 1,118,588; 1900, 1,381,625; 1910, 1,656,388. Population on July 1, 1914, was 1,773,482; 1920, 1,798,509. The population per square mile in 1910 was 36.5. The white population in 1910 numbered 941,086 and the negro population 713,874. The urban population, i.e., in places of 2500 or more, in 1910 was 496,516. Louisiana is the only one of the States in which the

French figured prominently in the early settlements. The descendants of these settlers constitute a large element in the present population. In recent years there has been considerable immigration from other parts of the country, particularly from the Northern States. In 1910 there were 112,717 native whites of foreign or mixed parentage. Of the foreign-born whites the largest number came from Italy. The State ranks sixth in the number of its negro population. In 1910 the negroes formed 43.1 per cent of the total population, compared with 50 per cent in 1890. By sex the population included 835,275 males and 821,113 females. The males of voting age numbered 414,919. New Orleans, the largest city, had a population in 1910 of 339,075. The other large cities with their populations in 1910 are as follows: Shreveport, 28,015; Baton Rouge, 14,897; Lake Charles, 11,449; Alexandria, 11,213; Monroe, 10,209 (qq.v.).

Education. Educational conditions in Louisiana were for a long time unsatisfactory, but recent efforts have rectified many of them. The State has the highest percentage of illiteracy among all the States, because the education of the negroes has been neglected and because there were few educational facilities offered to the people in the southern parishes until about 1905. A great many of the adults of the parishes are now illiterate because there were no schools for them to attend when they were growing into manhood and womanhood. In 1910, of a total population of 1,213,573 of 10 years and over, 352,179 were illiterate. The illiterates among the white population were 82,100, and among the negroes 254,148 out of a total of 525,450. The total school population according to the thirteenth census was, in 1910, 622,046. Of these, 252,764 attended school. The white school population was 287,134, of whom 158,758 attended school. The negro school population was 254,580, of whom 73,478 attended school. The total school population in 1914 was 526,268. The total enrollment of white pupils in high and graded schools in the school year 1912–13 according to the report of the State Superintendent of Education was 205,793, and the average attendance 137,473. In white high schools there were enrolled 17,408 students. The total teaching force in white schools numbered 5601. The total number of schools was 2321. The average monthly salary of male teachers in white schools was $78.33, and of female teachers $57.96. In colored schools the total enrollment was 67,729 and the average attendance 60,535. There were 1075 colored schools, with a teaching force of 1252. The average monthly salary paid to male colored teachers was $30.20, and female colored teachers $31.20. The total disbursements for education in 1912–13 were $6,973,150, and of this $3,137,825 was paid for teachers' salaries.

The Legislature of 1912 enacted a general law which amounted to a comprehensive revision of the educational system. This measure was primarily for the purpose of consolidating and simplifying existing laws, but in fact it did a great deal more. It abolished several State boards of an auxiliary character, centring their functions in a State Board of Education; increased the dignity and responsibility of the parish school boards; gave New Orleans a new plan of school government; introduced the budget system of finance; and, most important of all, provided a thorough and well-considered system of teachers' examinations and certificates under the State authority. In 1912–13 there were 144 State approved high schools and 238 consolidated schools, i.e., strictly country schools formed by combining two or more one-room schools. There are also numerous private schools in the city of New Orleans which enroll thousands of pupils. These schools are kept open for nine or 10 months during the year and do excellent work. Industrial work is carried on in the public schools.

There is an excellent parish organization of schools. The parish school board consists of from five to 10 men, whose term of office is six years. The board has control of all the schools in the parish and elects the parish superintendent, who must be a competent teacher. Every parish is required by the constitution to set aside as much as three mills of the parish assessment for educational purposes. The result of this machinery is that practically all of the parishes are employing good teachers and paying them fairly good salaries. Two-thirds of the white teachers are college or normal graduates or hold first-class certificates. The negro-school situation was deplorable according to the statement of the State Superintendent of Education in 1912–13. The schools are usually taught in churches, having no school furniture, and by teachers who are usually densely ignorant. Classes are too crowded for successful work; and the terms are from three to five months.

There are a State Normal School and the New Orleans Normal School at Natchitoches; the Louisiana Industrial Institute at Ruston; the Southwestern Louisiana Industrial Institute at Lafayette. The institutions for higher education are the Louisiana State University and Agricultural and Mechanical College (coeducational) at Baton Rouge; Jefferson College for men at Convent; Loyola University for men at New Orleans; Tulane University of Louisiana for men at New Orleans; Silliman Collegiate Institute for women at Clinton; Mansfield Female College at Mansfield; H. Sophie Newcomb Memorial College for women at New Orleans; Leland University at New Orleans and New Orleans University at New Orleans, coeducational institutions for negroes. Other institutions for the education of negroes are the Louisiana Academic and Industrial Institute at Alexandria; Gilbert Academy and Industrial School at Baldwin; Baton Rouge College at Baton Rouge; Sabine Normal and Industrial School at Converse; Homer College at Homer; Pleasanton Collegiate, Agricultural, and Industrial Institute at Hortman; Howe Institute at New Iberia; Luther College at New Orleans; Southern University and Agricultural and Mechanical College at Baton Rouge; Straight University at New Orleans. Most of these institutions are under denominational auspices.

Charities and Corrections. Charitable and correctional institutions include the Institute for the Deaf and Dumb at Baton Rouge, the Institute for the Blind at Baton Rouge, the Soldiers' Home at New Orleans, the Insane Asylum at Jackson, the Charity Hospital at New Orleans, the Shreveport Charity Hospital, and the State Penitentiary and convict farms. The leasing of convicts is prohibited by an Act of the Legislature passed in 1890. Convicts must be employed under absolute State control, and they are used chiefly for agricultural work. For this purpose Angola plantation, embracing 8000 acres of alluvial land on the Mississippi River, and Hope plantation, a sugar estate of some 2800 acres, were purchased for the use of convicts.

Religion. Slightly over one-half of the Church communicants are Roman Catholics. The State thus presents a striking contrast to the other Southern States, since it is the only one in which the Catholics have a large representation. The Protestant membership belongs mainly to the two dominant churches of the South—the Baptists and Methodists.

History. It is believed that the great river which Alvarez de Pineda, a Spanish explorer, entered in August, 1519, and followed up for some distance, was the Mississippi. Twenty-three years later the survivors of De Soto's expedition, in their overland journey to the Mexican town of Pánuco, must have traversed a large part of the present State. Authentic history begins with the year 1682, when Robert Cavelier de La Salle descended the Mississippi and took possession of the entire valley in the name of Louis XIV in whose honor he named the region Louisiana. La Salle's attempt to establish a colony in Louisiana ended in disaster and his own death, but in 1698 a second venture was made by Pierre Le Moyne, Sieur d'Iberville (q.v.), under the auspices of the Comte de Pontchartrain. In March, 1699, Iberville ascended the Mississippi for some hundreds of miles, then returned and built a fort at Biloxi and another on the Mississippi about 40 miles above its mouth. Under Iberville and his brothers Sauvolle and Bienville, who succeeded him in the chief command, the colony experienced but a puny growth, for the heat, fever, and lack of food proved fatal. In 1711, when Louisiana was made an independent colony, the number of inhabitants comprised in the group of settlements at Biloxi, Mobile, Cat Island, Ship Island, and the Isle of Dauphin was about 400, of whom the greater number were soldiers. In 1712 Louis XIV granted to Antoine Crozat, a Paris merchant, the exclusive privilege of trade and mining in Louisiana, for a period of 15 years. After sinking a large fortune in fruitless attempts to develop the country, Crozat surrendered his charter in 1717, and the region passed into the hands of the Company of the West, headed by John Law (q.v.), who proceeded to engineer his famous Mississippi Scheme. Colonization was actively carried on. Emigrants from Germany and Alsace were settled on the Arkansas and Red rivers, convicts from French prisons were brought over in considerable numbers, and negroes were imported from Africa. New Orleans, which had been founded in 1718, was made the capital in 1722. The growth of the colony was hampered by the restrictive commercial policy of the company and incessant quarrels among the officials. In retaliation for the massacre of the French inhabitants at Fort Rosalie in 1729, warfare was carried on with the Natchez Indians until they were exterminated, but in their operations against the Chickasaws the French were less successful. In 1733 Louisiana came directly under the crown, and for 30 years led a drowsy existence, and submitted quietly to a succession of inefficient governors. In 1763 France ceded Louisiana east of the Mississippi (with the exception of the island of Orleans) to England, the vast region west of the river with the city of New Orleans having been ceded to Spain by a secret treaty in the preceding year. The people were dissatisfied with Spanish rule, although it was much better than the French, and in 1768 the inhabitants of New Orleans rose in rebellion. The revolt was put down with effective cruelty by the Spanish General O'Reilly. With the development of the Kentucky and Tennessee regions, whose inhabitants required an outlet for their produce, the free navigation of the Mississippi had become by this time of great importance for the United States. When the Spanish denied the Americans free access to the Gulf, a situation arose which might have led to war, but resulted instead in the purchase of Louisiana from the French by the United States in 1803, Spain having relinquished the region to France in 1800. Louisiana then embraced all the present State of Louisiana west of the Mississippi, Arkansas, Missouri, Iowa, Minnesota west of the Mississippi, the Dakotas, Nebraska, most of Kansas and Indian Territory, and all of Wyoming, Montana, and Colorado east of the Rocky Mountains. In 1804 the region south of latitude 33° was organized as the Territory of Orleans, while the country north became the Territory of Louisiana in 1805 and the Territory of Missouri in 1812.

The State of Louisiana was admitted in April, 1812. (For military operations during the War of 1812, see UNITED STATES.) The economic development of the State was rapid and was accompanied by constitutional changes which harmonized the old civil law with the principles of the common law and republican institutions. In 1845 the choice of a Governor was given directly to the people, and in 1852 many judicial offices were made elective. In the year 1849 Baton Rouge became the capital. On Jan. 26, 1861, a convention passed an ordinance of secession without submitting it to a popular vote. With the outbreak of war the commerce of New Orleans disappeared almost entirely, and great want ensued throughout the State. (For military operations in Louisiana, see CIVIL WAR IN AMERICA.) In May, 1862, New Orleans was occupied by the Union troops, a military government was established, and the courts were reorganized. In 1864 a convention elected by the loyal element in the State framed a new constitution emancipating negro slaves immediately and unconditionally. By 1866 the State government had fallen into the hands of the conservatives, who proceeded to legislate against the freedmen, and an attempt made by the Unionists to reconvene the convention of 1864 in order to revise the suffrage requirements led to a riot in the streets of New Orleans (July 30, 1866), in which nearly 200 negroes were killed, while throughout the State negroes and white Republicans were terrorized systematically. On March 2, 1867, Louisiana became a part of the Fifth Military District under General Sheridan, who made full use of his broad authority. In 1868 a new constitution enfranchising the negroes was adopted against the vehement opposition of the conservatives, the Fourteenth Amendment was ratified, and military occupation came to an end in July, 1868. The great mass of white inhabitants were slow in reconciling themselves to the new conditions, and bitter feeling and turbulence marked the strife of parties and factions. In the election of 1872 the Democrats and Liberal Republicans were arrayed against the Radical Republicans. After a close poll, partisan boards of State canvassers declared either ticket elected, and two rival governments were organized, the Democratic government supported by the State militia, the Republican by the Federal troops. Violence and bloodshed ensued in 1874, and peace was established only in 1875 through the medium of a congressional committee. In 1876 there was another election dispute; a Republican returning board changed a Democratic majority of 8000 in the State into a Republican majority of 4000—a change which was all the more galling in that the electoral vote of Louisiana was sufficient to secure the election of the Republican candidate for the presidency. By refusing to continue the policy of Federal intervention in political contests within the State, President Hayes insured the triumph of the Democratic party, which has remained predominant since 1876. About 1875 was begun the system of river jetties and levees which has been continued at great expense to the State and the Federal government ever since, and has resulted in the improvement of navigation and the protection of the river banks from disastrous floods. The question of the renewal of the charter of the Louisiana Lottery Company was the chief issue in the hotly contested election of 1891, which went against the company. In 1894 the repeal of the bounty on sugar by Congress occasioned a split in the Democratic party in the State. After 1895 outbursts of racial feeling were frequent, and the determination of the white inhabitants to wipe out the negro as a political factor became apparent. In 1894–95 there were conflicts between white and negro labor in New Orleans, and in 1896, all through the so-called Black Belt, white men with arms drove negroes from the polls. By the so-called Grandfather Clause in the Constitution of 1898, which laid down the qualification for suffrage, the vast majority of the negroes were disfranchised, so that in 1900, out of 130,000 registered voters, it was estimated that only 7000 were colored, though the negro population almost equals the white.

Although Louisiana has not been so radical in the suppression of the liquor traffic as some Southern States, there have not been lacking efforts to control the selling of liquor. In 1908 an aggressive attempt was made in the Legislature to pass a measure providing for State prohibition, but this having failed, an Act was passed increasing the liquor license to $1000 and providing other regulations. The same Legislature passed a measure prohibiting the sale of liquor on trains passing through the State. In 1908 Jared Y. Sanders, Democrat, was elected Governor by a majority of over 40,000 votes. At the same election four constitutional amendments were adopted, the most important being one increasing the power of the State Railroad Commission. Another prohibited foreign railroad corporations from carrying their cases to the United States Supreme Court. At the national election held on Nov. 3, 1908, Bryan received 63,568 votes; Taft, 8958; Debs, Socialist, 2538. In 1910 there was formed a political organization, known as the Democratic Good Government League, with the purpose of opposing the political machine in the State and in New Orleans, and by 1912 the reform element had become strong enough to elect Luther Egbert Hall Governor. In 1912 Wilson received 61,035 votes; Roosevelt, 9323; Taft, 3834; Debs, 5249. A Constitutional Convention was held in 1913, which arranged for the sale of bonds to refund the State bonded debt due on Jan. 1, 1914. The Legislature of 1914 passed measures providing for the election of Senators in conformity with the provisions of the Seventeenth Amendment to the United States Constitution.

In national politics Louisiana has been Democratic-Republican and Democratic except in 1840 and 1848, when it voted for the Whig candidates, and 1876, when its electoral vote was given by the Electoral Commission (q.v.) to Hayes. In 1864 and 1872 its vote was not counted. The following have been the Governors of Louisiana since its organization as a Territory:

TERRITORY OF ORLEANS

William C. C. Claiborne		1804–12

STATE

William C. C. Claiborne	Democratic-Republican	1812–16
Jacques Philippe Villeré	“ “	1816–20
Thomas B. Robertson	“ “	1820–24
Henry Schuyler Thibodeaux (acting)	Dem.-Rep.	1824
Henry Johnson	Democratic-Republican	1824–28
Pierre Derbigny	“ “	1828–29
Armand Beauvais (acting)	“ “	1829–30
Jacques Duprè (acting)	“ “	1830–31
André Bienvenu Roman	Whig	1831–35
Edward D. White	“	1835–39
André Bienvenu Roman	“	1839–43
Alexander Mouton	“	1843–46
Isaac Johnson	Democrat	1846–50
Joseph Walker	“	1850–53
Paul Octave Hébert	“	1853–56
Robert C. Wickliffe	“	1856–60
Thomas O. Moore	“	1860–62
George F. Shepley	Military	1862–64
Henry W. Allen	Governor of Confederate part of State	1864–65
Michael Hahn	Unionist and Military	1864–65
James M. Wells	Democrat	1865–67
Benjamin F. Flanders	Military	1867
Joshua Baker	“	1867–68
Henry C. Warmoth	Republican	1868–73
John McEnery	Democrat and Liberal Republican. Not recognized by President or Congress	1873
William Pitt Kellogg	“Custom House” Republican	1873–77
Stephen B. Packard	Republican claimant; not recognized	1877
Francis T. Nicholls	Democrat	1877–80
Louis A. Wiltz	“	1880–81
Samuel D. McEnery	“	1881–88
Francis T. Nicholls	“	1888–92
Murphy J. Foster	Anti-Lottery Democrat	1892–1900
William W. Heard	Democrat	1900–04
Newton C. Blanchard	“	1904–08
Jared Y. Sanders	“	1908–12
Luther E. Hall	“	1912–16
Ruffin G. Pleasant	“	1916–20
John M. Parker	“	1920–

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ana (1906); Bond, *Historical Sketch of Louisiana and the Louisiana Purchase* (Washington, 1912). See also annual reports of State departments.

LOUISIANA. A city in Pike Co., Mo., 94 miles by rail northwest of St. Louis; on the Mississippi River, and on the Chicago, Burlington, and Quincy and the Chicago and Alton railroads (Map: Missouri, E 2). It has mineral springs known for their medicinal properties, a sanitarium, fine high school, and a public library. The city controls an important trade, particularly in fruit, produce, grain, live stock, etc.; and among its industrial plants are nurseries, flour and lumber mills, shoe and stove factories, manufactories of buttons, tobacco, cigars, carriages, tools, baskets, and wagons, a stone quarry, limekiln, brickyards, etc. The nurseries here are very extensive, ranking among the largest in the United States. Pop., 1900, 5131; 1910, 4454.

LOUISIANA GRASS. See PASPALUM.

LOUISIANA PURCHASE. The purchase by the United States from France in 1803 of the Province of Louisiana. In the spring of 1802 news reached the United States that Spain, by the secret Treaty of San Ildefonso, concluded in October, 1800, had retroceded Louisiana to France, and the uneasiness caused thereby was soon increased by the announcement that the Spanish Intendant had withdrawn the right of deposit secured to the inhabitants of the United States by the treaty of 1795, and that Louisiana was to be delivered to France at an early date. President Jefferson was alarmed at the prospect of danger arising from the proposed transfer to France, and declared that the day she took possession the ancient friendship between the United States and France would be at an end, and the United States must henceforth ally itself with the British nation. The President expressed this belief to Congress in his annual message, and at the same time wrote to the American Minister at Paris, Robert R. Livingston, that if France considered Louisiana indispensable to her interests, she might still cede to the United States the island of New Orleans and the Floridas, and thus remove, to some extent, the causes of the irritation. Believing that this end could be best accomplished by sending a man direct from the United States, he selected, in January, 1803, James Monroe to act as Minister Plenipotentiary with Livingston. The Senate confirmed the nomination, and placed the sum of $2,000,000 at their disposal to accomplish the object of the mission. The war between France and England had just been renewed, and Napoleon, realizing the invincibility of England on the sea, doubted the ability of France to hold Louisiana against such a power. To the astonishment of the commissioners, therefore, Napoleon, through Talleyrand, proposed to sell the entire Province of Louisiana, and asked for an offer. The Marquis de Marbois, Minister of the Treasury, was then selected by Napoleon to conduct the negotiations. In the meantime Monroe arrived (April 12), and the negotiations began in earnest. Marbois insisted on 100,000,000 francs and the assumption of Louisiana's debts by the United States, but finally agreed to take 80,000,000 francs, including 20,000,000 for the debts which the United States was to assume, and on this basis the sale was effected, April 30, 1803. President Jefferson did not think that the Constitution warranted the annexation of Louisiana, and considered that an amendment would be necessary—an "act of indemnity," as he expressed it; but there was such general acquiescence by the people that the matter was dropped, and Jefferson advised Congress that the less said about the constitutional difficulty the better. The treaty was ratified by the Senate on October 20 by a vote of 24 to 7, and was laid before both Houses, that they might provide for its execution. The treaty provided that the inhabitants of Louisiana should be incorporated into the Union and admitted to the full enjoyment of all the rights and immunities of citizens of the United States as soon as possible; that meanwhile they should be protected in the enjoyment of liberty, property, and worship; and that the ships of both France and Spain should for 12 years enjoy special privileges of entry at New Orleans. Accompanying the treaty were two conventions providing for the manner of payment and for the settlement of the debt. Up to June 20, 1880, the total cost of Louisiana was $27,267,621 (McMaster). The area purchased exceeded 1,000,000 square miles. The population did not exceed 90,000. The centenary of the Louisiana Purchase was celebrated by a remarkable exposition in St. Louis in 1904.

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LOUISIANA PURCHASE EXPOSITION. An international exposition held in St. Louis, Mo., from April 30 to Dec. 1, 1904, for the purpose of celebrating the one hundredth anniversary of the purchase of the Louisiana territory from France by the United States. A site for the Exposition was chosen in June, 1901. It was a tract in Forest Park of 1142 acres of well-wooded forest land within the city limits, and included about 110 acres belonging to Washington University, which, with its buildings, were leased to the Exposition Company.

The architectural plan comprised 15 large exhibition buildings, the main group of which was arranged in the form of a fan. The style adopted by the commission was a free treatment of the Renaissance. The apex of the fan was formed by the Art Palaces, four massive structures, the central of which in brick and stone remains as a memorial building, while the two wings were of brick and staff. Cass Gilbert was the architect. A Hall of Sculpture designed by

E. L. Masqueray was in the rear of the main building. To the north and east of the Art Palace was the Palace of Education and Social Economy, designed by Eames and Young in the classic style with modern modifications. To the east of this building was the Palace of Mines and Metallurgy, designed by Theodore Link in the modern Renaissance style, having an imposing entrance with Egyptian features. To the north was the Palace of Liberal Arts, one of the most beautiful of the larger group and designed in the style of the French Renaissance by Barnett, Haynes, and Barnett. To the west and to the north of the Palace of Education was the Palace of Manufactures, in the Corinthian style, designed by Carrère and Hastings. In this building were installed exhibits of a purely commercial character, while in the Palace of Varied Industries, to the west, were shown objects pertaining to industrial art. Southward of the Palace of Varied Industries was the Palace of Electricity, designed by Walker and Kimball. To the west was the Palace of Machinery, designed by Widman, Walsh, and Boisselier. The Palace of Transportation, in the French Renaissance style, was designed by E. L. Masqueray. Elsewhere was the Palace of Agriculture, the largest building of the Exposition, being 6546 by 1660 feet and covering 23 acres. This building was designed by E. L. Masqueray, who also was the architect of the Palace of Horticulture and the Palace of Forestry, Fish, and Game. In addition to these larger buildings there was the United States Government Building, designed by the United States Supervising Architect, which contained the exhibits shown by the various departments of the national government. Besides the foregoing there were upward of 500 distinct buildings on the grounds representing foreign governments, States and Territories, special exhibits, etc. Many of these were copies of famous buildings elsewhere. The French National Pavilion was a reproduction of the Grand Trianon of Versailles, while Louisiana reproduced the Cabildo of New Orleans, in which the actual transfer of the Louisiana territory took place.

The landscape features were exceptionally beautiful and included a rose garden of six acres with 50,000 rose bushes, sunken gardens 750 feet long, and an enormous floral clock with a dial 100 feet in diameter and hands 50 feet long, all constructed of flowers. The waterways culminated in a series of cascades which continued for 290 feet with a total fall of 95 feet and emptied into a grand basin from which there extended to the east and to the west lagoons on which were Venetian gondolas and other water craft. The decorative sculpture, under the supervision of an advisory committee consisting of J. Q. A. Ward, A. Saint-Gaudens, and D. C. French, included 250 groups and over 1000 single figures. Besides the Terrace of States, which consisted of heroic statues representing the States and Territories of the Purchase, there were statues of Jefferson by Ward and Napoleon by French, as well as an equestrian monument of the "Apotheosis of St. Louis" by Niehaus and a commemorative "Louisiana Purchase Monument."

The amusement features for the most part were confined to a street of concessions a mile long at the northern edge of the grounds, and known as "The Pike." Under the direction of the division of Anthropology were important exhibits of aboriginal tribes, conspicuous among which were a group of Batwa pygmies from Central Africa. Allied to these was the Philippine Exposition, towards which the government contributed $1,000,000. It covered 47 acres in the extreme western part of the grounds and included representatives of the more important native tribes, with a scientific exhibition of their arts, industries, and domestic life.

The total recorded admissions were 19,694,855, of which 12,804,616 were paid.

LOUISIANA STATE LOTTERY. See Lottery.

LOUISIANA STATE UNIVERSITY. A State institution of learning at Baton Rouge, La., first chartered in 1869 as the State Seminary, rechartered in 1870 as the State University, and again in 1877 when it was combined with the Louisiana Agricultural and Mechanical College. The university is based upon the State seminary, supported by the United States land grants of 1806, 1811, and 1826 and upon the land-grant college inaugurated by the Morrill Act of 1862. The seminary was first opened in 1860 near Alexandria under the presidency of Gen. W. T. Sherman and in 1869 was removed to Baton Rouge, where it became in 1870 the State University. The Louisiana Agricultural and Mechanical College was organized in New Orleans in 1874 and in 1877 was removed to Baton Rouge and merged into the university. In 1886 the United States government gave the use of the buildings and grounds of the military garrison at Baton Rouge, and in 1902 the full title to the property was vested in the institution.

The university is organized into the following schools and colleges: College of Arts and Sciences; College of Agriculture, including the Experiment Station; College of Engineering; Audubon Sugar School; Law School; Teachers College. In each department the course is four years in length, except in the Law School, which has a three-year course, and in the Sugar School, which has a five-year course. High-school graduation is required for admission to all courses. The degrees conferred are B.A., B.S., M.S., C.E., M.E., and M.A. Only one year of graduate work is offered. The university has four agricultural experiment stations, at Baton Rouge, New Orleans, Calhoun, and Crowley. In 1913–14 the faculty numbered 127 and the student body 1434. In the student body were represented all the parishes of the State, 14 other States, and 17 foreign countries. Tuition is free to all citizens of the United States, but residents of foreign countries pay a fee of $60. The library contains about 35,000 volumes. The endowment is $320,000, the annual income, exclusive of Experiment Station income, about $180,000, and the grounds, buildings, and equipment are valued at $800,000. The president in 1914 was Thomas D. Boyd, LL.D.

LOUIS NAPOLEON, *Fr. pron.* lōō'ē' nȧ'pō'-lȧ-ôN'. See Napoleon III.

LOUIS PHILIPPE, fē'lēp' (1773–1850). King of France from 1830 to 1848. He was the eldest son of Philippe, Duke of Orléans, and was born in Paris, Oct. 6, 1773. He received at his birth the title of Duke of Valois, and afterward that of Duke of Chartres. His education was intrusted to the care of the celebrated Madame de Genlis. On the outbreak of the Revolution he entered the National Guard and became a member of the Club of Friends of the Constitution, afterward that of the Jacobins. His father renounced his titles in 1792 and assumed the surname of Egalité, and Louis Philippe followed his example. In the same year, as lieutenant general, Louis Philippe took part in the battle of Valmy. He distinguished himself at Jemappes (Nov. 6, 1792); but his situation became very dangerous after the battle of Neerwinden (March 18, 1793), in which he suffered defeat with Dumouriez. He was included in the order for arrest issued against Dumouriez, and in April, 1793, escaped with him into Austrian territory. He sought in Switzerland a place of security for his sister, Adelaide, wandered about among the mountains for four months, and accepted a situation as teacher of geography and mathematics in a school at Reichenau, near Chur, assuming the name of Chabaud-Latour. After the execution of his father, November, 1793, he traveled for some time in the north of Europe, was in the United States from 1796 to 1800, and then took up his residence at Twickenham, near London, with his two younger brothers, one of whom died in 1807 and the other in 1808. In 1809 he married Marie Amélie, daughter of Ferdinand I of the Two Sicilies. In 1808 and again in 1810 he made abortive attempts to play a part in the Spanish War against Napoleon. On the fall of Napoleon he hastened to Paris, where he was received with distrust by Louis XVIII. After the Restoration he recovered his great estates, which the Imperial government had sequestrated. Disliked by the court, he was very popular with the inhabitants of Paris. He kept aloof, however, from political intrigues. When the bloody days of the July revolution of 1830 had ended with the overthrow of the government of Charles X, the Chamber of Deputies, at the instance of the banker Laffitte, appointed him Lieutenant General and Regent of the Kingdom (July 30, 1830). A week later the two Chambers offered him the royal crown, which he formally accepted on Aug. 9, 1830, taking the oath to the reformed constitution. He defended his conduct towards the elder Bourbons by protesting that he acted for the welfare of France. Louis Philippe sought to strengthen his throne by gaining the support of the *bourgeoisie*, or middle classes, and repressed all the extreme parties by what became known as the *juste-milieu* policy. The brief ministry of Laffitte (1830–31) was succeeded by that of Casimir-Périer (1831–32), on whose death Marshal Soult formed a coalition ministry, with Thiers and Guizot as the leading spirits. Among the events which marked the early years of the reign of Louis Philippe were the abolition of the hereditary peerage (1831); the armed intervention in behalf of Belgium; the insurrections of workingmen in Lyons, Paris, and elsewhere; the attempt of the Duchess of Berry to excite a revolution in behalf of her son, the Duke of Bordeaux (1832); and the appearance of Abd el Kader as the leader in the struggle against the French in Algeria. In 1836, and again in 1840, Louis Napoleon made abortive attempts to excite military insurrections in his favor. After various ministerial changes the Soult-Guizot cabinet was installed in 1840, Guizot, who held the portfolio of Foreign Affairs, being its virtual head. In 1841 the work of converting Paris into what was expected to be an impregnable fortress was begun. In 1842 the Duke of Orléans, the heir to the crown, met with an accidental death—a loss which was deeply deplored by the nation. The foreign policy of Louis Philippe, which was in general that of peace, aroused great dissatisfaction among the people, who after 1840 were swept away by a revival of Napoleonic sentiment, stimulated by the removal of the Emperor's bones from St. Helena and their interment at the Invalides. The conquest of Algeria, accomplished during this reign, could not counterbalance the weakness of the French diplomacy in the East, where France refused to join the Powers in their repression of Mehemet Ali in 1840. The extreme democrats hated the King, and frequent attempts were made on his life, the most notable of which was that of Fieschi in 1835. The country prospered under Louis Philippe's government; but the scandals which were brought to light in the administration, the shameless corruption in the electoral system, and the selfish course pursued by the King, alienated the affections of the people. (See FRANCE.) A demand for reform in the electoral system, which contained an undemocratic provision for a property qualification for the franchise, became loud and general, and was unwisely opposed by the King and the Guizot (q.v.) ministry; while the conduct of the former in the matter of the marriages of the Queen of Spain and her sister, manifesting a disregard of every consideration but the interests of his own family, excited a strong feeling of indignation throughout Europe. The French nation became much excited; "reform banquets" began to be held, and upon the attempt of the government to suppress them by force, insurrectionary disturbances ensued in the streets of Paris on Feb. 22, 1848. On the following day the "citizen King" saw with alarm that the National Guard could not be expected to support him. The retirement of Guizot failed to pacify the people. On February 24 the King abdicated in favor of his grandson, the Count of Paris; but the Chamber of Deputies refused to acknowledge the boy as King. Louis Philippe, deserted by his courtiers, fled to the coast of Normandy, concealed himself for some days, and at length found opportunity of escaping in a British steamboat to Newhaven, under the name of Mr. Smith. The brief remainder of his life was spent in England. He died at Claremont, Aug. 26, 1850. His affectation of democratic ideals had not blinded the French people to his alliance with the financial and business interests of the upper middle classes against the political and economic aspirations of the lower classes.

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LOUIS QUATORZE, lo͞o′ĭ kȧ-tôrz′ (Fr. *quatorze*, fourteen). The name given to that phase of French architecture and decorative art which developed during the reign of Louis XIV (1643–1715). In the perpetual struggle between the romantic and classic, or the Gallic and Latin, influences which marks the entire course of French architectural history since 1500, this reign exhibits the complete dominance in external design of the Latin or classic tendency; while in interior design there is a singular divergence between the classic or Italian spirit of the church interiors and the free, original, and sometimes gay and trivial treatment of the interiors of palaces. In these the classic orders are freely varied or disappear; stucco and carved woodwork, great mirrors, and the general prevalence of white and gold are the chief decorative elements. Curved lines, moldings interrupted by leaves and scrolls, panels within panels, coved ceilings without heavy cornices, and a general avoidance of classic formality are characteristic, in strange contrast to the cold dignity of the colonnades, colossal orders, and severe grandeur of the exteriors. The notable architects of this period and style are Louis Levau, Jacques Lemercier (q.v.), the two Mansarts (q.v.), Claude Perrault, and, in domestic architecture, R. de Cotte and the brothers Lepautre (q.v.). The colossal palace of Versailles (q.v.) is the full embodiment of the style; its chapel one of the most perfect examples of its possibilities; while the colonnade of the Louvre (q.v.) is its grandest achievement in exterior decorative design.

The Louis Quatorze style in furniture displays a costly elegance and dignity suited to royal palaces. Chairs, fauteuils, and tables are framed with curved lines throughout, and upholstered with specially woven tapestries and brocades. The use of exquisitely wrought ornaments in gilt bronze, inlays of brass, ivory, and tortoise shell, and the increasing use of lacquer are characteristic of this work. The family of Boulle (q.v.) attained great fame as cabinetmakers to the King, and their work commanded fabulous prices. The style of Louis XIV passes gradually into that of Louis XV. See Louis Quinze; Interior Decoration.

LOUIS QUINZE, kăɴz (Fr. *quinze*, fifteen). The name given to that phase of French architecture and decorative art which developed during the regency and the reign of Louis XV (1715–74). The characteristics of the previous style (see Louis Quatorze) were carried to the extreme in interior decoration and furniture, while in exterior design the classic tendency still dominates in such monuments as the Panthéon by Soufflot, and the two beautiful colonnades by Gabriel on the north side of the Place de la Concorde (known as the colonnades of the Garde-meuble), but yields to a freer spirit in such façades as the stables at Chantilly, the hôtels de Saussure at Geneva and de Matignon at Paris, and the Fountain of the Grosse Horloge at Rouen. In interior decoration the orders were banished, curved lines replaced straight lines wherever possible, corners were rounded, and white and gold reigned supreme except for the frequent use of paintings by artists like Boucher, Nattier, and Coyzevox, framed in the fantastic scrolls and moldings of ceilings, wall panels, and doors. The simple and dignified curves of the Louis Quatorze furniture are replaced by the most extravagantly contorted lines conceivable, and shells and ragged acanthus leaves constantly recur. Imitation of Chinese models, especially in lacquer, became fashionable. The Boulle (q.v.) family is represented in this period by its most famous member, André Charles, who carried into his work under Louis XV the style and methods developed under Louis XIV and accentuated them. The execution of the carving, inlays, lacquer work, and bronze ornaments of this period was as admirable as the designs were often reprehensible on the score of good taste; and in the lighter forms of design and in the best examples there is often much charm of fanciful invention and delicacy of detail. It was a style of revolt and protest against the trammels of classic rules—the *Art Nouveau* of the eighteenth century. See Interior Decoration.

LOUIS SALVATOR, sȧl-vä′tôr (1847–). An Archduke of Austria (house of Lotharingia-Hapsburg), and a traveler and author. Born in Florence, the son of Grand Duke Leopold II of Tuscany, he devoted himself in his youth to scientific studies and developed no small skill as a draftsman. He traveled through the Mediterranean and visited Asia, Africa, and America. The Imperial Austrian Academy of Sciences and the Bohemian Academy of Sciences elected him to honorary membership. His books, mostly illustrated by his own pencil, include: *Los Angeles in Südkalifornien* (1885); *Die Balearen* (1869–91); *Um die Welt ohne zu wollen* (4th ed., 1886); *Die liparischen Inseln* (1897); *Ramleh als Winteraufenthalt* (1900); *Helgoland* (1900); *Sommertage auf Ithaka* (1903); *Zante* (1904); *Wintertage auf Ithaka* (1905); *Ueber die Durchstich der Landenge von Stagns* (1906); *Parga* (1907); *Anmerkungen über Levkas* (1909); *Die felsenfesten Mallorcas* (1910); *Einiges über Weltausstellungen* (1911); *Sommerträumereien am Meeresufer* (1912); *Hafen von Porto-Palma in der Bucht von Palma de Mallorca* (1913).

LOUIS SEIZE, sâz (Fr. *seize*, sixteen). The name given to that phase of French architecture and decoration which marked the reign of Louis XVI (1774–92). Towards the end of the reign of Louis XV a reaction set in from the extravagances of the prevailing style (see Louis Quinze), asserting itself especially in interior design. While it was dominated by the classic spirit, and while in exterior architecture the classical revival was supreme, interior decoration began to exhibit, in connection with great severity of line, a taste for playful and delicate detail wholly free from the riotous frivolity of the preceding period. Straight lines reappear everywhere, and the ornament is restrained and appropriate, white and gold still furnishing the chief color scheme. The stucco relief in ceilings and on walls is especially delicate. The reaction appears under Louis XV in the Petit Trianon (1768), and finally passes into the style of the Empire, which developed under the new classic spirit of the Napoleonic era. The architects

Gabriel, Percier, and Fontaine were active during this period, and the last two under the Empire. See INTERIOR DECORATION.

LOUIS THE GERMAN (c.800–876). King of the Eastern Franks from 843 to 876. He was the third son of the Emperor Louis the Pious, and when his father in 817 made a division of the Empire among his sons, Louis received a kingdom centring around Bavaria. This was the nucleus of the Kingdom of Germany. In the later divisions, between 829 and 840, Louis always retained Bavaria. During these years he was engaged in almost constant struggles against his father or against his brothers. After the death of Louis the Pious, in 840, he joined with Charles the Bald against Lothair. In 841, in the battle of Fontenoy, he and Charles defeated Lothair and forced the latter in 843 to agree to a fresh division of the Empire in the Treaty of Verdun. Louis remained King of the German or East Frankish Kingdom, ruling over Bavarians, Swabians, Franconians, and Saxons. He had to defend his dominions against Slavic invaders on one side and Northmen on another. In 858 he invaded the West Frankish Kingdom and conquered it in part; but in 860 he made peace, resigning his conquests to Charles the Bald. In 870 he forced Charles the Bald to make the Treaty of Mersen, by which the Lotharingian territories were divided between the West Frankish and the German kingdoms. His sons frequently revolted against him, but he always crushed their revolts. He died at Frankfort, Aug. 28, 876. Consult Ernst Dümmler, *Geschichte des ostfränkischen Reiches* (3 vols., 2d ed., Berlin, 1887–88).

LOUIS (I) THE GREAT (1326–82). King of Hungary from 1342 to 1382. He was the son of Charles Robert, King of Hungary. He was an indefatigable warrior and generally victorious. His long war against Queen Joanna of Naples (see JOANNA I) was indecisive, although for a time Louis occupied the city. With Venice he waged three wars and secured, in 1358, from the Venetians most of the Dalmatian cities. In 1352 he had brought Moldavia under his power. He waged a successful war with the Turks. In 1370 he succeeded Casimir as King of Poland, to which the latter had already by conquest united Galicia. In 1381 he secured the rest of Dalmatia by treaty. He was succeeded in Hungary and Poland by his daughter Mary, who became the wife of Sigismund of Brandenburg, subsequently Holy Roman Emperor. Louis was renowned for his chivalry and the splendor of his court. He increased the royal power, gave charters to the cities, encouraged commerce and education, and reformed the administration of justice, thus on the one hand improving the welfare of his country, on the other, by his costly wars, menacing all prosperity. Consult Mihály Horváth, *Geschichte Ungarns*, vol. i (2d ed., Ger. trans., Budapest, 1876).

LOUIS TREIZE, trâz (Fr. *treize*, thirteen). The name given to that phase of the Renaissance architecture and decorative art of France which developed during the reign of Louis XIII (1610–43). It is transitional between the lawlessness and fantastic vagaries which characterized the period of Henry IV (1589–1610) and the somewhat coldly classical formality of the style of Louis XIV. (See LOUIS QUATORZE.) The architects De Brosse (q.v.) and J. Lemercier (q.v.) followed classic and Palladian models with considerable purity, as in the Luxembourg Palace (q.v.) by the first named, and in the churches of the Oratoire and Sorbonne by the second; but one frequently encounters in the details of doorways and interior decoration traces of extravagance and undisciplined taste persisting from the preceding period. See INTERIOR DECORATION.

LOUISVILLE, lo͞o′ĭ-vĭl *or* lo͞o′ĭs-vĭl. The largest city of Kentucky and the county seat of Jefferson County, on the Ohio River, 130 miles below Cincinnati and 110 miles distant by rail (Map: Kentucky, E 3). It is the *entrepôt* of the lower Ohio, which here descends, by a series of rapids, 26 feet in 2 miles. The channel of Beargrass Creek, which flows through the eastern part of the city, has been straightened, and the bottom of the creek lowered by concrete invert and channel walls in order to prevent the overflow of the river by backwater in that part of the city and also to carry off water from the sewers. Steamers from the city reach 33 navigable rivers, and railroad facilities are excellent—10 great systems entering here, among which are the Southern, the Chesapeake and Ohio, the Cleveland, Cincinnati, Chicago, and St. Louis, the Illinois Central, the Louisville and Nashville, the Baltimore and Ohio Southwestern, and the Pittsburgh, Cincinnati, Chicago, and St. Louis railroads. Three steel railroad bridges span the Ohio—two to Jeffersonville, one of which has been reconstructed recently, and one to New Albany. The only inland life-saving station in the United States is situated here.

Louisville, the Falls City, 27 square miles in extent, lies 60 feet above low-water mark and is free from inundations. It is surrounded by a fine agricultural country, particularly adapted to truck gardening, and is adjacent to a region of immense forests and coal and iron mines. It has a river front of 7 miles. There are about 200 miles of streets, mostly well paved with macadam, brick, asphalt, and granite, skirted to some extent with fine shade trees, and regularly laid out. The street-railway system comprises 308 miles and extends to all parts of the city and its suburbs.

Louisville is noted as a centre for education. It is the seat of the academic, medical, and law departments of the University of Louisville; Louisville College of Pharmacy; Louisville College of Dentistry; Jefferson School of Law; Kentucky Institute for the Education of the Blind; Southern Baptist Theological Seminary; Presbyterian Theological Seminary of Kentucky; Louisville City Hospital Training School for Nurses; State University (colored). There is also a splendid school system, comprising four high, two normal, 46 ward, and a number of other public schools. One million dollars in bonds have been voted for the extension of this system. Among the more prominent structures are the county courthouse, a fine specimen of architecture noted for its doric columns, a city hall, armory, customhouse, and the Louisville Free Public Library, having about 177,000 volumes and consisting of a central building and eight branches, besides several stations in schools, factories, etc. These were made possible by the gifts of Andrew Carnegie, amounting to $450,000. In connection with the library are a museum with fine collections of minerals, birds, and shells, and an art gallery. There are 13 charitable institutions, prominent among which are the Masonic Widows and Orphans Home, St. Joseph's Orphan Asylum (Roman Catholic), German Protestant Orphans Home, the Louisville Industrial School of Reform; and among the important hospitals, St. Joseph's, the Norton, Deaconess, the United States Marine, and the new city hospital, costing $1,000,000.

There are several musical clubs and two art associations, which give a series of exhibits each spring. A bronze statue of Thomas Jefferson, designed by Moses Ezekiel, stands before the courthouse and in the interior of the building is a marble statue of Henry Clay, by Joel T. Hart; a statue of Daniel Boone, by Enid Yandell, stands in Cherokee Park. In the public library are many fine pieces of sculpture, notably busts of Abraham Lincoln, Madison Cawein, and Joel T. Hart; and on the spot where Fort Nelson was situated a granite memorial has been erected to commemorate the establishment of the town.

The city has an extensive park system. Cherokee Park (409 acres) lies at the terminus of Cherokee Parkway and is noted for its natural beauty. Other large preserves are Iroquois Park (676 acres), situated on a wooded hill south of the city, Central Park, and Shawnee Park (181 acres), at the terminus of Broadway, containing a long sandy river beach which affords good bathing facilities. There are also numerous smaller parks and playgrounds. Cave Hill Cemetery, in the eastern part of the city, is beautifully laid out and contains the graves of Col. George Rogers Clark, founder of the city, several members of the family of George Keats, and other well-known persons. Five miles east of the city lies the grave of President Zachary Taylor, over which a monument has been erected by the government.

With its exceptional transportation facilities, Louisville is naturally the centre of a vast distributing and export trade. It is perhaps the largest leaf-tobacco market in the world and one of the largest tobacco-manufacturing centres. In the production of straight corn whisky it ranks first, having more than 66 distilleries in the district. There are also large wholesale hardware and grocery houses; important stockyard and packing-house interests; extensive plow, wagon, and organ works; and manufactories of sole leather, corduroy, cement, men's clothing, bathtubs, axe handles, drugs, chairs, sewer pipes, etc. These industries represent an invested capital of $79,000,000, a production valued at $101,000,000 annually, and give employment to 32,000 persons. There are several good newspapers, including the *Courier Journal*, Louisville *Herald*, *Evening Post*, Louisville *Times*, Louisville *Anzeiger*, etc.

The government is vested in a mayor elected every four years, a bicameral council, and administrative departments as follows: boards of works, safety, sewer commissioners, park commissioners, sinking-fund commissioners, and water works, controller, gas inspector, and city buyer, nominated by the executive with the consent of the council; and city attorney and assessor, elected by the council. The schools are in charge of a commission elected by popular vote. Louisville's income in 1912–13 was $11,212,000, while its payments amounted to $9,332,000, the chief items of expense being $436,000 for the police department, $350,000 for the fire department, $320,000 for sanitation, $868,000 for education (including libraries), and $247,000 for maintenance of the water-supply system. The assessed valuation of property (1914) was $207,000,000. Bank clearings in 1913 amounted to $715,731,000. The city owns and operates the water works; the plant, acquired in 1860, includes a $3,000,000 filtration system (one of the finest of its kind in the United States) and now comprises 348 miles of mains. Pop., 1800, 359; 1850, 43,194; 1870, 100,753; 1890, 161,129; 1900, 204,731; 1910, 223,928; 1914 (U. S. est.), 235,114; 1920, 234,891.

In 1778, 13 families came down the river with Col. George Rogers Clark and settled on a small island—since eaten away by the river—near the head of the Ohio Falls. In the following year they moved to the mainland and laid the foundations of the present city. In 1780 the settlement, with a population of about 60, was incorporated as a town by the Virginia Legislature and named Louisville in honor of Louis XVI of France. In 1824 it was chartered as a city by the Kentucky Legislature. Other charters were granted in 1851, 1870, and in 1892. The Louisville and Portland Canal was authorized by the Legislature in 1825, opened in 1830, and in 1874 passed under Federal control. The first steam railroad in the State (1838) ran from Louisville to Portland. On Aug. 6, 1855 (Bloody Monday), a mob, said to have been incited by the Know Nothings (q.v.), destroyed much property and killed a number of persons. During the Civil War the city was Unionist in sympathy. In September, 1862, the Confederates under General Bragg threatened an attack, but withdrew on the arrival of General Buell's army. In March, 1890, a tornado that swept through the city caused the death of 100 persons and destroyed property worth $3,000,000.

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LOUIS WILLIAM I, MARGRAVE OF BADEN-BADEN (1655–1707). He was the son of Ferdinand Maximilian, heir to the throne of Baden. He was born in Paris, brought up in Baden, and served under Montecuculi against the French. After the Treaty of Nimeguen (1678) he fought as field marshal's lieutenant in the Imperial army against the Turks, in 1683 at Vienna, in 1689 at Nissa, in 1690 in Transylvania, in 1691 at Slankamen. In 1693 he was on the Upper Rhine, captured Heidelberg, and fought in Alsace. During the War of the Spanish Succession he served under Marlborough and became field marshal in 1704. He was an excellent military engineer.

LOULÉ, lō-lā′. A town in the extreme southern part of Portugal, in the former Province of Algarve, now the District of Faro, picturesquely situated 7 miles northwest of Faro (Map: Portugal, B 4). It is an old town, with remains of Moorish walls and towers, and several notable churches, one of which, Nossa Senhora da Piedade, is a place of pilgrimage. The principal industry is the manufacture of wickerwork, and there are silver and copper mines in the neighborhood. Pop., 1900, 22,511; 1911, 19,688.

LOULÉ, lô-lā′, Marquis of (1785–1824). A Portuguese statesman. Born at Lisbon, educated with John VI, created Marquis (1807), he commanded the Portuguese in the army under Napoleon I, rejoined John VI in Brazil, returned with him to Portugal, and was assassinated by the absolutists for his liberalism and his loyalty to the King.—His son (1801–75), created Duke of Loulé (1826), married the Infanta Anna de Jesus María (1827), was Prime Minister in 1857–59 and in 1862–65 and President of the Council in 1868–70.

LOUNS′BURY, Thomas Raynesford (1838–1915). An American literary historian and critic, born in Ovid, N. Y., Jan. 1, 1838. Lounsbury graduated at Yale in 1859 and subsequently received honorary degrees from Yale, Harvard, Lafayette, Princeton, and Aberdeen. He was engaged editorially on the *New American Cyclopædia* from 1860 to 1862 and enlisted then in the 126th New York Volunteers, in which he was first lieutenant to the close of the Civil War. He then taught in New York and studied Early English. In 1870 he became an instructor in Sheffield Scientific School, Yale, and from 1871 until his retirement in 1906 he was professor of English language and literature. For 33 years he was also librarian of the School. He was elected a member of the American Academy of Arts and Letters. His work is marked by sound scholarship and literary acumen. It is as a student of Chaucer, of Shakespeare, and of the English language from the point of view of its development that Professor Lounsbury especially distinguished himself. His more important publications include: *A History of the English Language* (1879, 1894); *Life of James Fenimore Cooper* (1882), an admirable biography: *Studies in Chaucer* (3 vols., 1891); *Shakespeare as a Dramatic Artist* (1901); *Shakespeare and Voltaire* (1902); *The Standard of Pronunciation in English* (1904); *The Text of Shakespeare* (1906); *The Standard of Usage in English* (1908); *English Spelling and Spelling Reform* (1909); *Shakespeare as a Dramatic Artist* (1912). His editorial work includes: *Chaucer's Parliament of Foules* (1877); the *Complete Works of Charles Dudley Warner* (1904), with biographical introduction; and the *Yale Book of American Verse* (1912).

LOUNT, lount, Samuel (1791–1838). A Canadian political leader and patriot. He was born on the Susquehanna River in Pennsylvania, emigrated to Upper Canada in 1811, and settled on a farm at Holland Landing. He was elected the Reform member for Simcoe County in the Upper Canada Legislative Assembly and served two years (1834–36). In 1836 he was again a candidate, but was unsuccessful. His sympathies were with the advanced Reformers during the period of political discontent which resulted in the Upper Canada rebellion in 1837–38 (see Political Parties, *Canada*), and he held a command in the insurrection planned by Dr. John Rolph (q.v.) and William Lyon Mackenzie (q.v.). After the defeat of Mackenzie's adherents near Toronto, Lount attempted to escape to the United States, but was captured, tried, and condemned, along with Peter Matthews (q.v.), for high treason and was hanged at Toronto on April 12, 1838. Strong petitions were made in his behalf, and his execution was disapproved by eminent public men both in Britain and Canada. The principle of responsible government for which Lount gave his life was introduced three years later as part of the Canadian constitution and in 1849 was finally established and accepted. A monument was erected in 1903 in memory of Lount and Matthews in the Necropolis at Toronto.

LOUPS, lo͞oz. The French name for the Delawares, Pawnee, and certain other Indian tribes. See Mahican.

LOURDES, lo͞ord. One of the chief places of Catholic pilgrimage in Europe, in the Department of Hautes-Pyrénées, France, on the right bank of the Gave de Pau, 12 miles south-southwest of Tarbes (Map: France, S., D 5). The old part of the town on the right bank is commanded by a former fortress now used as a prison. There are many grottoes and marble and slate quarries in the vicinity. The fame of Lourdes dates from 1858, when, it was believed, the Virgin appeared to a young girl, Bernadette Soubirous. The grotto near which the apparition took place is now surmounted by the magnificent church of the Rosary, built in accordance with the wish of the Virgin and containing numerous crutches, banners, shields, medallions, tablets, and other precious gifts from pilgrims who visit Lourdes. These number about 600,000 per annum. Near the grotto is the miraculous spring, the water of which is diverted into several basins in which the ailing pilgrims bathe. A time of "national pilgrimage" with religious ceremonies and torchlight procession is held here each August 20. The water is also exported in bottles. Economically the town is entirely dependent on the pilgrims, and its chief products are various souvenirs, mostly of a religious character, and marble. Pop. (commune), 1901, 8708; 1911, 8805.

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LOURDES. A novel by Zola, based on the celebrated miracles at Lourdes.

LOURE, lo͞or. An ancient French dance in $\frac{3}{4}$ or $\frac{4}{4}$ time and slow tempo. It was named after an old French instrument resembling a bagpipe. It appears frequently as one of the movements in the suites of the eighteenth century.

LOURENÇO MARQUES, lô-rāN′sô mär′kĕsh. The southern province of Portuguese East Africa (q.v.).

LOUSE (AS., OHG. *lūs*, Ger. *Laus*, louse; perhaps connected with AS. *lēas*, OHG. *lōs*, Goth. *laus*, empty, vain, AS. *for-lēosan*, Goth. *fraliusan*, OHG. *for-liosan*, Ger. *ver-lieren*, to lose, Lat. *luere*, Gk. λύειν, *lyein*, to loose, destroy). A parasitic bug of the suborder Anoplura or Parasita, which contains the single family Pediculidæ, dwelling on man and other animals. Lice are grayish-white, more or less transparent, compressed, wingless insects, with fleshy blood-sucking beaks. It is still not certain just how the blood is sucked up. Schiödte placed a louse on his hand and observed it under a lens while feeding. He noted alternate contractions and expansions of parts of the alimentary tract, while the entire tract underwent peristaltic movements and vibrations from side to side. The number of known lice is not large—about six genera and 40 species are recorded. Different kinds of mammals are infested with different kinds of lice, even those mammals that live in water. Seals have a genus, *Echinopthirius.* Several species of the genus *Pedicinus* infest monkeys. Elephants have a louse (*Hœmatomyzus proboscideus*) with a remarkably long proboscis. The louse of the horse (*Hœmatopinus asini*), that of the pig (*Hœmatopinus urius*), and that of the cow (*Hœmatopinus eurysternus*) are the best known of those that dwell on domestic animals. Three species belong to man: one (*Pediculus capitis*) is found on the head; another (*Pediculus vestimenti*) on the body, breeding in soiled clothing; and a third (*Phthirius inguinalis*) lives in the eyebrows, armpits, and the pubic region. Andrew Murray stated that the heads of different races of men are infested with different varieties of *Pediculus capitis,* basing his conclusions upon the collections made by Darwin.

Little is known concerning the development of lice. The eggs are fastened to the hair, and the young, although they molt several times, do not undergo metamorphosis. There is a disease called phthiriasis attributed to lice, but for aught that is really known the lice may be merely an accompaniment of the neglected and unclean condition which, perhaps, is really the cause of the disease. Mercurial ointment is generally recommended for use against the species affecting human beings. Cleanliness is the best preventive of lice on man and beast. To destroy them on domestic animals washing with infusions of soapsuds, tobacco, and kerosene is recommended. Various ointments composed of lard or tallow, in which sulphur or zinc is mixed, are sometimes used. Wood ashes and Persian insect powder sprinkled plentifully in the hair or wool are also said to be efficacious. Such washings and applications should be repeated several times at intervals, and barns which contain infested animals should be thoroughly whitewashed.

The word is also used in combinations such as bird louse, plant louse. The plant lice are Hemiptera, but belong to a different family, the Aphididæ (see APHID); while the bird lice belong to the Mallophaga (q.v.), a distinct order of insects parasitic on birds. Consult Osborn, *Insects Affecting Domestic Animals* (Department of Agriculture, Washington, 1896).

LOUSE FLY. Any one of the curious degraded parasitic flies of the family Hippoboscidæ. In the adult stage they live, like lice, parasitically upon the bodies of birds and mammals. Some species are winged, others are wingless, and others are winged for a time and then lose their wings. They form the curious group known as Pupipara, the eggs having hatched and the larva developed until the pupa stage is nearly reached within the body of the mother. They are extruded by the parent fly only when nearly ready to become pupæ. The proboscis of the adult consists of two hard flaps which spread apart, allowing the sucking tube to be thrust out from the head. The so-called sheep tick (*Melophagus ovinus*) is a member of this group. The insect known in England as the forest fly (*Hippobosca equina*) is a winged species which occurs upon the horse. One of the commonest North American species is *Olfersia americana,* found upon the horned owl, certain hawks, and the ruffed grouse or partridge. The members of this family have been called bird ticks; but this name is very misleading, since they are not confined to birds, and they have no relation whatever to the true ticks. See FOREST FLY; TICK.

LOUSE′WORT. A popular name for a genus of plants. See PEDICULARIS.

LOUSIAD, lou′zĭ-ăd, THE. A mock-heroic poem (1785) in five parts by John Wolcott (Peter Pindar), suggested by the presence of an insect on a plate of peas set before George III. The occurrence is said to have resulted in the compulsory shaving of the heads of the kitchen servants.

LOUTH, louTH. A maritime county of the Province of Leinster, Ireland, bounded north by Armagh and the Lough of Carlingford, east by the Irish Sea, south by the Boyne and the County of Meath, and west by Meath and Monaghan (Map: Ireland, E 4). Area, 316 square miles. Wheat, barley, oats, and green crops are extensively grown. Linen is largely manufactured. Capital, Drogheda. The county derives its name from the decayed old town of Louth, where St. Mochta founded an abbey about 500, the ruins of which still remain. This abbey was one of the greatest ecclesiastical schools in Ireland and produced more than 130 bishops before it was burned by the Danes in the ninth century. Pop., 1901, 65,740; 1911, 63,665.

LOUTH, louth. A market town and municipal borough in Lincolnshire, England, 25 miles east-northeast of Lincoln, on the Lud (Map: England, G 3). The town has iron foundries, a variety of manufactures, and an important trade in agricultural produce. By means of the Loughborough Canal, connecting the town with the Humber, considerable traffic in corn and coal is carried on. Among its interesting features are the beautiful parish church of St. James, built in the thirteenth and rebuilt in the fifteenth century, with a fine spire 294 feet high; a richly endowed grammar school, founded in the reign of Edward VI; and the ruins of Louth Park Abbey, dating from the twelfth century. The town is provided with gas and water and owns markets, a cemetery, and a technical school. It received its charter from Edward VI. Pop., 1901, 9500; 1911, 9880.

LOUTH. A Church of England divine. See LOWTH, ROBERT.

LOUTHERBOURG, lo͞o′târ′bo͞or′, PHILIPPE JACQUES DE (1740–1812). A French landscape, marine, and battle painter and etcher. He was born at Strassburg and received his first instruction from his father, who was a miniature painter. In 1755 he went to Paris and became a pupil of Casanova, a battle painter. He gained great repute as a popular painter of battles, hunts, marine views, and landscapes, and was also successful in biblical subjects and portraits. In 1767 he was made member of the Academy of Painting in Paris and afterward appointed court painter to the King. He settled in England (1771) and in 1781 was made member of the Royal Academy. His landscapes and marine subjects are characterized by romantic feeling, quaint imagination, and facility and vigor of execution. His large battle scenes, "Lord Howe's Victory on June 1, 1794" (Greenwich Hospital), "Admiral Duncan's Victory at Camperdown, 1797," "Landing of British Troops in Egypt," and the "Siege of Valenciennes," were much admired by his contemporaries. His other works include the "Burning of London in 1666" (1797); "Destruction of Spanish Armada"; "Storm at Sea" (1767, Oldenburg Gallery); "Landscape after Storm" (1765, Liechtenstein Gallery, Vienna); "Cumberland Lake" (National Gallery, London); and several paintings in the Dulwich Gallery. He designed many plates and vignettes for Macklin's *Bible*, Bowyer's *History of England*, and similar works which have considerable merit. He was also known as an eccentric and follower of the famous Cagliostro (q.v.). Consult L. E. Dussieux, *Les artistes français à l'étranger* (3d ed., Paris, 1876).

LOUTRE, Louis Joseph. See Le Loutre, L. J.

LOUVAIN, lo͞o'văN' (Flem. *Leuven*, Ger. *Löwen*). A famous town in the Province of Brabant, Belgium, situated on the Dyle, 18 miles east of Brussels (Map: Belgium, C 4). The ramparts of the ancient capital of Brabant, over 7 miles in circumference, have been converted into promenades. Its town hall is regarded as among the finest on the Continent. It is a late Gothic building, erected by Matthew de Leyens in 1447–63, with three façades profusely adorned with statuary and reliefs and six octagonal turrets terminating in spires. The archives here are valuable. The church of St. Pierre (1425–97) is a well-proportioned cruciform building and contains "The Last Supper," by Dierick Bouts, also paintings by P. J. Verhaghen and J. van Rillaert the Elder. The Flamboyant fifteenth-century church of St. Gertrude is noted for its carved choir stalls, dating from the sixteenth century. The churches of St. Michel and St. Jacques also contain some interesting paintings, and the modern church of St. Joseph has frescoes by Meunier and Dujardin. The principal modern buildings are the theatre and the post office. The famous University of Louvain (q.v.) occupies the former warehouse of the cloth makers' guild. Besides the university, Louvain has a royal athenæum, two seminaries for teachers, a domestic science school, and an industrial and an art school. In the fourteenth century Louvain was one of the principal centres of cloth making in Europe, about 15,000 people having been engaged in that industry. After several insurrections in the second half of the fourteenth century the town was taken by Duke Wenceslas of Brabant in 1382, and his severe treatment of the citizens compelled thousands to emigrate to Holland and England. The textile industry of Louvain is now practically extinct. At present the chief products of the town are beer and spirits, tobacco, machinery, chemicals, straw hats, lace, vinegar, and starch. Pop., 1900, 42,070; 1910, 42,123. In 891 the Normans were defeated by Arnulf at Louvain, and in 986 the town became the residence of its own counts, who subsequently became the dukes of Brabant. In the sixteenth century the plague carried off about half of the population. During the European War which began in 1914 Louvain was occupied by the Germans after severe fighting. The town was set on fire, and many of the buildings destroyed, because the Germans claimed that their troops were fired on by Belgian civilians. It also had to pay a heavy war indemnity. See War in Europe.

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LOUVAIN, University of. A Belgian university which was founded in 1425–26 by John IV, Duke of Brabant, and richly endowed by the citizens. It had some 28 colleges, the most famous of which was the Collegium Trilingue, founded in 1517 for the study of Greek, Latin, and Hebrew, by Hieronymus Buslidius. This made it for a time the greatest stronghold of the New Learning in Europe. In the later sixteenth century it became one of the most powerful agencies in the Counter Reformation. In 1788 three of its faculties were moved to Brussels. It was suppressed during the wars of the French Revolution, restored after the expulsion of the French from Belgium, and again suppressed when Belgium revolted from Holland. The new University of Louvain grew out of a foundation at Mechlin by the Belgian church (Catholic) of a university in 1834, moved the next year to Louvain, and was supported by the church under control of the bishops. This has no connection with the old foundation. It had 2855 students in 1912–13, in the usual four faculties. Its library contained 120,000 volumes and 250 incunabula. The university and library were completely destroyed in 1914 by the German army, and work was completely suspended, facilities being offered to both the faculty and the students to avail themselves of the hospitality of Oxford and Cambridge and other British universities. Consult Reusens, *Documents relatifs à l'histoire de l'Université de Louvain*, vols. iii–v (Louvain, 1886–90), and H. V. Gill, "Louvain and its University," in *Irish Monthly*, vol. xlii (Dublin, 1914).

L'OUVERTURE, lo͞o'vĕr'tür'. See Toussaint, François Dominique.

LOUVET DE COURVRAY, lo͞o'vȧ' de ko͞o'vrȧ', Jean Baptiste (1760–97). A French politician and man of letters. He was born in Paris and in 1787 acquired notoriety by the publication of a licentious romance, *Les aventures du Chevalier Faublas*. Embracing the cause of the Revolution, he became a journalist and pamphleteer and defended the excesses of the new régime against the supporters of the old. In the Jacobin Club, where he was a prominent speaker, he attacked Robespierre openly and, on being expelled, joined the Girondists in the Convention. On Oct. 29, 1792, he delivered his famous philippic against Robespierre's aspirations towards the dictatorship. Involved in the fall of the Girondists, he escaped capture by flight. He returned to the Convention in 1795, after the fall of Robespierre, and became a member of the Five Hundred in the following year. Louvet undoubtedly was a man of high principles, apt to be carried away by enthusiasm. He wrote a novel, *Emilie de Vermont* (1791), dealing with the question of divorce, and *Mémoires sur la révolution française* (ed. by Aulard, 1889).

LOUVIERS, lōō′vyȧ′. A town in the Department of Eure, France, 18 miles south-southeast of Rouen (Map: France, N., G 3). Its thirteenth-century Gothic church of Notre Dame has a number of fine tombs, statues, and windows, and a magnificent portal of the fifteenth century. The town hall has a museum and a library. Louviers has long been noted for its cloth; it also manufactures machinery, enamel ware, large bells, and leather. Pop. (commune), 1901, 10,219; 1911, 10,209.

LOUVOIS, lōō′vwä′, FRANÇOIS MICHEL LE TELLIER, MARQUIS DE (1641–91). Minister of War under Louis XIV. He was born in Paris, Jan. 18, 1641. His father was Chancellor and Secretary of State in the War Department and purchased for him the reversion of this office. Louvois entered the public service in 1662 and succeeded him as War Minister in 1666. He displayed great administrative ability; the organization of the French Army and War Office under him was the most progressive and efficient in all Europe; but he was always willing to involve Europe in the horrors of war, that he himself might be indispensable to the King. His war policy was ruthless, men of every class being practically forced to serve in the army. After the death of Colbert (1683) he became the chief adviser of the King, whose favor he partially lost by counseling him against the marriage with Madame de Maintenon. He instigated the persecution of the Huguenots and involved France in the long war of the League of Augsburg. He was responsible under the King for the merciless devastation of the Palatinate in 1689 with the ultimate capture of Strassburg. The relations between Louis XIV and Louvois were strained by the ill success of the first year of the war, and the Minister's influence was fast disappearing when he died suddenly, July 16, 1691. Consult: Rousset, *Histoire de Louvois et de son administration politique et militaire* (Paris, 1863–65); Michel, *Louvois et les protestants* (ib., 1870); James, *Lives of Cardinal de Retz, Jean Baptiste Colbert, John de Witt, and the Marquis of Louvois* (Philadelphia, 1837), popular, but not recommended for historic accuracy. See FRANCE; LOUIS XIV.

LOUVRE, lōō′vr′, PALACE OF THE. An extensive group of buildings in Paris, including and connected with a quadrangular square on the north bank of the Seine, in the centre of the city. The site is supposed to have been originally a hunting site and was later a castle. The main keep was built in 1204, and many towers were added by Charles V. The Louvre was used as a fortress, arsenal, and prison, and only occasionally as a royal residence. The feudal building remained unchanged until Francis I took down the keep in 1527. In 1541 he decided on its entire reconstruction, according to a plan submitted by Pierre Lescot (q.v.), in the new Renaissance style. This plan called for four façades around a square, with four corner pavilions. The west front was begun by Pierre Lescot in 1546; he finished the southwest pavilion in 1556 and half of the south side in 1564. Under him worked Jean Goujon (q.v.), the greatest decorative sculptor of the French Renaissance, whose sculptures for the windows, doors, and interior details are famous. What remains of this inner west front is the most perfect example of the French form of the middle Renaissance. The Louvre, as it now stands, is about four times the size of Lescot's intended building. The "great" and "small" galleries, extending to and along the Seine, were commenced in 1554 under Henry II, after Lescot's designs, but not completed until the close of the century under the architects Métézeau, Du Cerceau, and others. The long gallery west of the original quadrangle, with its main façade on the Seine, was completed in 1608, but was entirely reconstructed on a new design after the Commune fire in 1871. Even as thus altered, it is still one of the most impressive of French Renaissance structures. It connected the Louvre with the Tuileries, then in course of erection.

The new plans adopted by Richelieu for the quadrangle of the Louvre itself were by Jaques Lemercier (q.v.), and their centre was the Pavillon de l'Horloge which was begun in 1624. The west side was then finished and the north side begun. Under Louis XIV the west and inner east sides were first completed by Levau; and then, by order of Colbert, architects were requested to send in designs for a monumental outer façade for the east side, the most beautiful of which proved to be that of an amateur architect, the physician Claude Perrault; it was adopted and carried out between 1665 and 1670. This façade, with its 28 pairs of large Corinthian columns, known as the Colonnade of the Louvre, is one of the purest of Neo-classic monuments, superb and impressive in its grandiose proportions. Unfortunately its height required the adding of upper stories to other parts of the palace, which not only detracted from their effect, but led to their unroofing and temporary dilapidation, owing to the neglect of Louis XIV, who concentrated all his extravagance on Versailles (q.v.).

It was not until the time of the wars of the French Revolution, when Napoleon's victories in Italy gave him the opportunity to bring back such a multitude of artistic treasures to France, that the idea of turning the Louvre into the great national gallery and museum led to its restoration and completion on a grand scale. After the preliminary clearing away Napoleon I intrusted to Percier and Fontaine the task of building on the Rue de Rivoli a north connecting gallery between the Louvre and the Tuileries, to correspond to the old long gallery, and this scheme was completed by Napoleon III —thus completing the New Louvre around the Place du Carrousel. The scheme was due to the well-known Franco-Italian Visconti (q.v.) and is one of the most splendid architectural undertakings of modern times; it was completed by his partner and successor Lefuel in 1859, at a cost of about $15,000,000. The work of Visconti and Lefuel included not only the connecting gallery above mentioned, but new wings, courts, and pavilions west of the old court, and a new north façade for the older structure along the Rue de Rivoli. The area covered and inclosed by the Louvre and Tuileries, thus combined, was about 50 acres. The Tuileries and a large part of the connecting galleries were, however, ruined by the fire which destroyed the Tuileries in 1871. The work of reconstruction, including the redesigning of the Great Gallery, was promptly undertaken by the Third Republic and completed about 1883.

The collections contained in the galleries of the Louvre are probably the most valuable in any one building in the world. The treasures of the Cabinet du Roi were increased by Colbert under Louis XIV by the addition of the Mazarin and Jabach collections, bringing the paintings from about 200 to nearly 850, with 6000 drawings. An inventory of 1710 enumerated 2403 paintings. These auspicious beginnings were interrupted by the removal of the collections to Versailles and the Luxembourg. It was not until 1793 that the Musée National was opened at the Louvre, largely from the various royal collections. Napoleon enriched it with about 2000 of the choicest paintings of Europe levied by him as indemnities from the countries conquered in his wars, thus making the Louvre by far the first collection of the world; but these were restored by the allies to the rightful owners after his fall in 1815. From that time until the accession of Napoleon III not many additions were made to the pictures, but other departments were organized, such as that of sculptures, based on the Musée d'Angoulême (1824), and the Musée des Monuments Français, first founded by Lenoir; that of ceramics, beginning with the Tochon collection of 574 vases in 1818, and the Durand collection of about 2200 vases in 1825. The Egyptian collections were started with the results of the work of Champollion and enriched by those of Mariette.

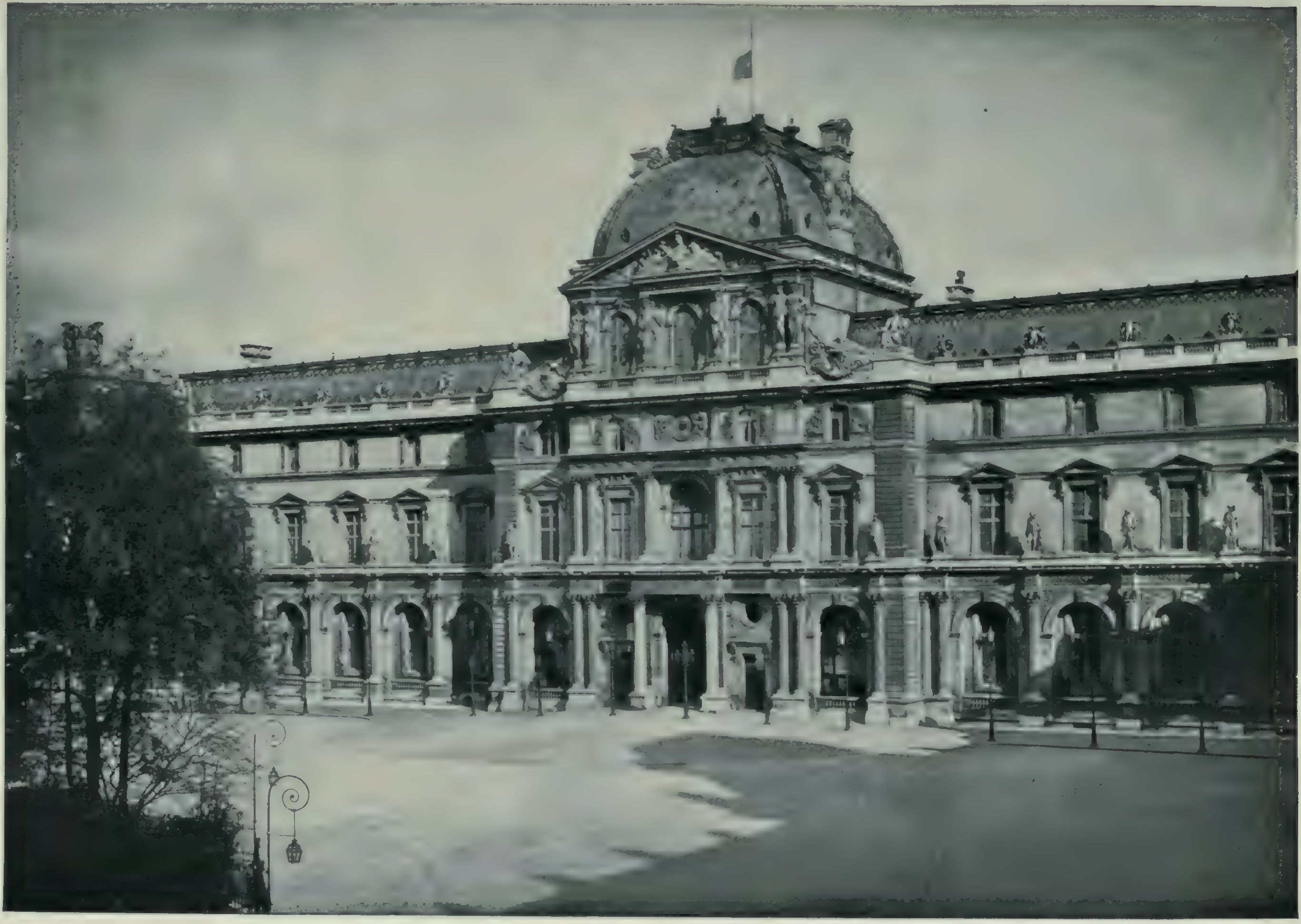
The golden age for the collections was inaugurated early in the reign of Napoleon III by the results of the discoveries of Botta in Assyria, supplemented later by Place, and extended to other parts of western Asia by Renan and others. The purchase of the immense Campana collection in 1862–63 added greatly to the departments of antique sculpture, jewelry, bronzes, glass, ceramics (c.2000 vases), and even to the paintings (c.200). The splendid policy of sending out government missions to explore and excavate (*missions scientifiques et littéraires*), either directly or through the French archæological institutes of Athens, Cairo, and Rome (Ecole Française d'Athènes, etc.), crowded the museums with antiquities fresh from the soil, sometimes in great series. The nucleus for the department of the decorative arts of the Middle Ages and the Renaissance was formed by the Durand collection in 1824 and received 400 important additions from the Revoil collection in 1828. To-day they are richly represented. The custom of bequeathing collections to the Louvre has steadily grown in France, since the Lacaze legacy of 265 pictures in 1869, and the accessions under the Third Republic have been quite as much due to private generosity as to the use of public funds and the results of archæological excavations. The chief of these private collections of paintings presented since 1900 are the Thorny-Thierry, the Moreau-Nelaton, and the Chauchard. All three are rich in paintings of the modern French schools, particularly the Barbizon. The Louvre contains the largest collection of paintings in the world, and possesses many famous masterpieces. French art is best represented, and next in number and importance are the Italian masterpieces. Among these may be mentioned four magnificent Mantegnas; the "Belle Jardinière" and the portrait of Baldassare Castiglione, by Raphael; Leonardo da Vinci's priceless "Mona Lisa," his "Madonna, Infant Christ, with St. Anne," and his "Madonna of the Rocks" (see VINCI, LEONARDO DA); and five Titians, including "The Man with the Glove" and "The Entombment." The Flemish painters, particularly Rubens and Van Dyck, are admirably represented; and so are the Dutch, especially Rembrandt and Jacob Ruysdael. Chief among the treasures of antique sculpture are the "Venus of Milo" and the "Victory of Samothrace."

There are now seven departments: (1) Egyptian antiquities; (2) Oriental antiquities and ceramics; (3) Greek and Roman antiquities; (4) paintings, drawings, and prints; (5) sculptures of the Middle Ages, Renaissance, and modern times; (6) decorative art of the Middle Ages, Renaissance, and modern times; (7) marine and ethnographic collections. These departments are each in charge of a conservateur and assistant. Some of the catalogues and other illustrative works issued are scholarly, and the large group of eminent scholars in charge have made possible the establishment of the famous Ecole du Louvre in 1882, with advanced courses intended to develop specialists in archæology and art. The full course of instruction covers three years of study. In 1909 the Museum of Decorative Arts, consisting of collections of furniture, tapestries, lace, metal works, ceramics, etc., was transported from the Palais de l'Industrie to the Pavillon de Marsan in the Louvre, with the understanding that it was to become the property of the state after the expiration of 15 years.

Bibliography. Albert Babeau, *Le Louvre et son histoire* (Paris, 1895); M. K. Potter, *Art of the Louvre* (Boston, 1905); *Palais du Louvre, extérieur et intérieur* (New York, 1905); Gustave Geffroy, *Le palais du Louvre: architecture, mobilier, objets* (Paris, 1909); E. C. Bicknell, *Louvre* (Boston, 1912); E. E. Richards, *The Louvre* (ib., 1913); J. C. Van Dyke, *Paris: Critical Note on the Louvre* (New York, 1914).

LOUYS, lōō'ē', PIERRE (1870–). A French poet and novelist, born in Paris. He studied at the lycée of Janson de Sailly, became a bachelor of science and of letters, and studied at the Sorbonne. At 19 he founded a review called *La Conque*. He then became identified with members of the Parnassian school and later married Louise de Heredia, daughter of José Maria de Heredia (q.v.), author of the *Trophées*. He became famous in 1896, when his novel *Aphrodite* was published. This was produced as an opera in 1906 and translated into a number of languages; altogether more than 300,000 copies have been printed. Whether from indolence or a desire to await inspiration, Louys made a practice of writing only when it suited his fancy. His poems appeared occasionally in such reviews as the *Mercure de France*. His works include: *Astarté* (1892); *Chansons de Bilitis* (1894); *La femme et le pantin* (1898); *Le roi Pausole* (1901); *Sanguines* (1903); *L'Archipel* (1906); *Psyché* (1909). He also made numerous translations, such as *La vie des courtisanes* (1894), from Lucan.

LOVAGE, lŭv'ăj (OF. *luvesche*, *levesche*, Fr. *livèche*, from Lat. *ligusticum*, lovage, from *Ligusticus*, Ligurian, from *Liguria*, Liguria, from *Ligus*, *Ligur*, a Ligurian; influenced by popular etymology with *love*), *Levisticum*. A genus of plants of the family Umbelliferæ. Common lovage (*Levisticum officinale*) is a native of the south of Europe, with ternate decompound leaves and obovate wedge-shaped leaflets. It is sometimes cultivated in gardens and, notwithstanding its strong and peculiar odor, is used as a salad plant. Its aromatic, acrid, and



THE LOUVRE, PAVILLON SULLY

stimulant roots and seeds are used in confectionery and medicine.

LOVAT, lŭv'at, SIMON FRASER, twelfth LORD (c.1667–1747). A Scottish chieftain and Jacobite intriguer. He was the second son of Thomas Fraser, fourth son of Hugh, ninth Lord of Lovat. His mother was Sybilla, daughter of the chief of the Macleods. He was educated at King's College, Aberdeen, graduated M.A. in 1683, and always bore the reputation of a scholarly man. The Frasers, of Norman origin, possessed extensive territories in the County of Inverness. Simon had influence with the clan and, although not the direct heir, acquired these lands by intrigue. He also abducted and compelled the widow of the late lord to marry him—a course which involved him in constant turmoil. On the accession of Queen Anne, when his opponents became all-powerful, he fled to the Continent and became a Roman Catholic. He was at the bottom of the hoax called the Queensberry Plot in 1703, in which he professed to reveal the policy of the exiled court and a plan for a rising in its favor among the Highlanders. He had been outlawed, but he was still the darling of his clan, and in 1713 they sent an ambassador to bring him over. The holder of his estates having joined the insurrection of 1715, Simon found it his interest to take the government side. His clan at once left the insurgents; and for this good service he was invested with the estates, not only by the votes of his clan, but by the law. His life for the ensuing 30 years was active with local intrigues calculated to strengthen his influence. In the insurrection of 1745 he tried to play a double game, sending forth his clan, under the command of his son, to fight for the Pretender and deeply plotting for that cause, while he professed to be a loyal subject. He thus became a special object of the vengeance of the government and after various vicissitudes was captured, taken to London, tried, and beheaded. Consult John Anderson, *Historical Account of the Family of Frisel or Fraser* (Edinburgh, 1825); Burton, *Life of Simon, Lord Lovat* (London, 1847); W. C. Mackenzie, *Simon Fraser, Lord Lovat: His Life and Times* (ib., 1908).

LOVE, AUGUSTUS EDWARD HOUGH (1863–). An English physicist and mathematician. He was educated at Wolverhampton and St. John's, Cambridge, of which he became a fellow. In 1899 he was made Sedleian professor of natural philosophy at Oxford. Following Lord Kelvin, he developed the modern theory of elasticity in his great *Treatise on the Mathematical Theory of Elasticity* (1892–93; 2d ed., 1906) and wrote *Theoretical Mechanics* (1897), *Problems of Geodynamics* (1911), and important contributions to the *Encyclopædia Britannica* and the *Encyclopädie der Mathematischen Wissenschaft*.

LOVE, COURT OF. See COURT OF LOVE.

LOVE À LA MODE. A comedy by C. Macklin (1759).

LOVE BIRD. The popular name for many diminutive parrots of various genera and even of different families, natives of the warm parts of America, of Africa, the East Indies, and Australia. They receive their name from the affection which they manifest towards one another, whether in a wild state or in a cage. African species (*Agapornis roseicollis* or *Agapornis pullaria*) about the size of a sparrow are now common as cage birds in Europe and America. They are lively birds and fond of being caressed. They feed on the seeds, etc., on which canaries are fed and are fond of chickweed and other plants, with seeds ripe or nearly so. The South American love birds are all members of the genus *Psittacula*, of which seven or eight species are known. The African species are of the genus *Agapornis*, and the Australian and East India love birds are grouped in several genera. Of these last, one species (*Nasiterna pygmæa*) is noted as the smallest of the parrots. See Colored Plate of PARROTS.

LOVE FEAST. A religious service observed by certain bodies in imitation of the agapæ of the early Christians. (See AGAPÆ.) It is celebrated by Moravians generally in connection with a solemn festival or preparatory to the communion. Hymns are sung, simple food is served, and in some churches the minister makes an address at the close. Wesley introduced the observance among the Methodists, appointing one evening in each quarter for the men, another for the women, and a third for both together. In the Methodist Episcopal church the feast is celebrated at the quarterly conference, under the charge of the presiding elder, or, in his absence, of the pastor of the church. The Lord's Supper is also often observed at the same time. Love feasts after the primitive order are held in some of the Baptist missionary churches, and every Sunday by the Sandemanians.

LOVE'JOY, ARTHUR ONCKEN (1873–). An American professor of philosophy, born in Berlin, Germany. He graduated from the University of California (A.B., 1895) and from Harvard (A.M., 1897) and studied at Paris (1898–99). He served as assistant and associate professor of philosophy at Leland Stanford (1899–1901) and as professor of philosophy at Washington University, St. Louis (1901–08), at the University of Missouri (1908–10), and at Johns Hopkins after 1910. In 1909 he was president of the Western Philosophical Association and in 1910 vice president of the American Philosophical Association. He is author of various contributions to journals of philosophy.

LOVEJOY, ELIJAH PARISH (1802–37). An American Abolitionist, born at Albion, Me. He graduated at Waterville College in 1826 and in 1827 removed to St. Louis, Mo., where he became a teacher and also edited a Whig newspaper, the *Times*, in 1828–32. He attended Princeton Theological Seminary in 1832–33, was licensed to preach, and at once established at St. Louis the *Observer*, which became an influential Presbyterian paper. At first he refrained from taking any part in the antislavery agitation, but as time went on he began to insert occasional paragraphs in his paper which evinced a moderate opposition to slavery, and finally, aroused by the burning of a negro murderer, he wrote an editorial that excited the wrath of the proslavery element. Menaced, he removed his press, in 1836, to Alton, Ill., where it was seized by a mob and thrown into the river. Citizens of Alton presented him with another press, and on Sept. 8, 1836, he began the publication of the Alton *Observer*. During the following year he became an outspoken Abolitionist and advocated the formation of a State antislavery society in Illinois. The direct result was a visit, in August, 1837, from another proslavery mob, which wrecked the *Observer* office and destroyed the press. A third press was bought, only to be at once destroyed upon its arrival. A fourth was then procured and placed in a warehouse under guard of 20 or more armed citizens. At about midnight on Nov. 7, 1837, the place was attacked by 30 or 40 men, who, after being warned, were fired upon, and one man was killed. Undismayed by this fatality, one of the assailants attempted to set the warehouse on fire, whereupon Lovejoy stepped out of the building to shoot him, but was himself shot and mortally wounded. The garrison then surrendered, and the press was destroyed. This event caused great excitement throughout the country. Henry Tanner, one of the defenders of the warehouse, wrote *The Martyrdom of Lovejoy* (Chicago, 1881). Consult: J. C. and Owen Lovejoy, *Memoir* (New York, 1838); Garrison, *William Lloyd Garrison* (ib., 1885); "The Alton Tragedy," in May, *Some Recollections of our Anti-Slavery Conflict* (Boston, 1869).

LOVEJOY, Owen (1811–64). An American Abolitionist, brother of Elijah P. Lovejoy (q.v.). He was born at Albion, Me.; was educated at Bowdoin College, and removed to Alton, Ill., where he witnessed the death of his brother. A man of powerful physique, intense feeling, and great magnetism, he preached and lectured against slavery with a passionate energy that carried the people with him. In 1838 he became pastor of a Congregational church in Princeton, Ill., where he distinguished himself by the boldness of his attacks upon slavery from the pulpit and his open defiance of the laws prohibiting antislavery meetings. In 1854 he resigned his pastorate to accept a seat in the Legislature. From 1856 until his death he was a member of Congress, where he took an active part in the parliamentary conflicts that preceded the Civil War.

LOVEJOY, Owen Reed (1866–). An American sociologist, born at Jamestown, Mich., and educated at Albion (Mich.) College (A.B., 1891; A.M., 1894). He served as a minister of the Methodist Episcopal church in Michigan from 1891 to 1898, and then was pastor of the Congregational church at Mount Vernon, N. Y., until 1904. After three years as assistant secretary of the National Child Labor Committee, he became general secretary in 1907. (See Child Labor.) He published a number of bulletins on uniform child-labor laws, on child labor in the glass industry, and on similar subjects.

LOVELACE, lŭv′lâs. In Richardson's *Clarissa Harlowe,* a finished libertine, based upon Lothario in Rowe's *Fair Penitent.*

LOVELACE, lŭv′lâs, Francis (c.1618–c.1675). A Colonial Governor of New York. He was the second son of the first Baron Lovelace and was born in the Parish of Hurley, Berkshire. He adhered to the royal cause during the Puritan Revolution and the period of the Commonwealth and in 1668 was rewarded with the appointment of Governor of New York to succeed Richard Nicholls. Lovelace allowed religious freedom and encouraged trade and the fisheries, but he refused all demands for representative government, levied heavy taxes, and caused protests made against them by some of the Long Island towns to be burned by the hangman. When, in 1673, a Dutch fleet appeared in the bay, the majority of the inhabitants received it with joy; and before Lovelace, who was absent from the town, could return, the place surrendered. He was allowed to return to England, and is thought to have died a year or two thereafter.

LOVELACE, Richard (1618–58). A Cavalier poet, born at Woolwich, Kent, in 1618 and educated at the Charterhouse School and at Gloucester Hall, Oxford, where he was "accounted the most amiable and beautiful person that ever eye beheld." He took an active part in the Revolution and was twice imprisoned (1642 and 1648). After the execution of the King he was released. He began writing verse while at Oxford. A comedy entitled *The Scholar,* performed there in 1636, and a tragedy entitled *The Soldier,* written during the second Scottish expedition (1640), have been lost. While in prison Lovelace prepared for the press a volume of rarely beautiful lyrics, fastidiously polished, and for the most part crowded with meaning, which appeared in 1649, under the title *Luscata.* Lovelace died in poverty in 1658. In 1659 appeared *Posthume Poems of Lovelace.* The poems that represent him at his best are but a few, but these, by their well-nigh flawless perfection, will have a secure place in the treasury of English poetry. His poems were edited by Hazlitt (London, 1864).

LOVELAND, lŭv′l*a*nd. A city in Larimer Co., Colo., 60 miles by rail north of Denver, on the Colorado and Southern and the Great Western railroads (Map: Colorado, D 1). It contains a hospital, Carnegie library, and the Loveland Grand Cañon, and near by is the picturesque Estes Park. Loveland is situated in a rich farming and fruit region, and among its industrial establishments are a large beet-sugar factory, flour mills, grain elevators, alfalfa mills, extensive canning factories, nurseries, gypsum mills, brick factories, and a condensery owned coöperatively by the farmers and business men of the city. There are municipal water works and electric-light plant. Pop., 1900, 1091; 1910, 3651.

LOVE LIES A-BLEEDING. A tragedy. See Philaster.

LOVE-LIES-BLEEDING. A garden plant. See Amaranth, and Plate of Acanthus.

LOVELL, lŭv′*e*l, James (1737–1814). An American patriot, born in Boston. He graduated at Harvard in 1756 and became a teacher in his father's celebrated institution, the Boston Latin School. Unlike his father, he espoused the Patriot cause in the pre-Revolutionary disputes between Great Britain and her colonies, and in 1771 delivered the first anniversary oration on the Boston Massacre. Upon the British evacuation of Boston he was carried as a prisoner to Halifax, but in November, 1776, was exchanged. He was a member of the Continental Congress in 1776–82. He failed to comprehend Washington's great ability, and assisted in the attempt of the so-called Conway Cabal (q.v.) to put General Gates in supreme command. From 1784 to 1788 he was receiver of taxes in Boston, from 1788 till 1789 was receiver of the port of Boston, and then became the naval officer of Boston and Charlestown.

LOVELL, John (1710–78). An American educator. He was born in Boston; graduated at Harvard in 1728; was appointed assistant in the Boston Latin School in 1729 and master in 1734. The latter position he held until 1775, when the school was suspended by the siege of Boston. During this long period the stern, yet popular, old scholar was familiarly called Master Lovell, and among his pupils were many leaders of the Revolution. At the dedication of Faneuil Hall in 1743 he was the chosen orator. He was, however, a Loyalist, and with the British troops left Boston in 1776, going to Halifax, where he died. His portrait by Smybert is in Memorial Hall at Harvard.

LOVELL, Mansfield (1822–84). An American soldier, born in Washington, D. C. He graduated at the United States Military Academy in 1842, was appointed a lieutenant of artillery, and served in the war with Mexico, being wounded at Monterey, and becoming aid to General Quitman in 1846. In 1854 he resigned from the army, and from 1858 to 1861 was superintendent of street improvements and deputy street commissioner of New York City. In 1861 he entered the Confederate service, was made major general, and served in command of the Department of the South, with headquarters in New Orleans (which he was obliged to surrender to Admiral Farragut), and afterward in northern Mississippi, Georgia, and South Carolina. When the war was ended he retired to a plantation near Savannah, and after a few years went to New York as assistant engineer to Gen. John Newton in removing obstructions to navigation at Hell Gate, East River.

LOVEL (lŭv'el) **THE WIDOWER.** A novel by W. M. Thackeray (1861). It appeared as a serial in *Cornhill Magazine.*

LOVÉN, lō-vān', Sven Ludvig (1809–95). A Swedish zoölogist, born in Stockholm. He graduated at Lund and later studied in Berlin. After obtaining the doctorate at Lund in 1829 he became a docent at the University of Stockholm. In the interests of science he traveled through Norway, explored the coasts of Sweden and Finland, and in 1837 led the first scientific expedition to Spitzbergen. In 1840 he was appointed professor and in 1841 intendant in the State Museum of Natural History in Stockholm. He devoted himself to the study of anatomy and physiology of sea fauna, especially the formation of polyps and the geographical distribution of animals and birds in the Arctic regions. His chief works are *Etudes sur les échinoïdes* (1874) and *On Pourtalesia, a Genus of Echinoidea* (1883).

LOVENJOUL. See Spoelberch de Lovenjoul.

LOV'ER, Samuel (1797–1868). An Irish novelist, born in Dublin, Feb. 24, 1797. He began his career as a painter and attracted considerable attention, especially by his portrait of Paganini, exhibited at the Royal Academy in 1833. He had by this time gained favor by several ballads, among which was the famous *Rory O'More* (1826). From songs he turned to sketches and novels of Irish life, characterized by farcical humor. Among them are: *Legends and Stories of Ireland,* with etchings by the author (1831), and concerned chiefly with peasant types and peasant life; *Rory O'More, a National Romance* (1837), which was dramatized by himself and proved most popular on and off the stage, with its brave, good-humored, clever, and faithful peasant hero; *Handy Andy* (1842), the most popular of his books, full of roaring farce provided by the blundering buffoonery of an Irish servant lad; and *Treasure Trove* (1844), a story of the Irish brigade, and the least effective of Lover's books. His tendency towards farce and caricature interferes with the fidelity of his pictures of the life of his country and makes their points of contact with reality uncertain and to be determined only by one familiar with the social types and social conditions of the Ireland of his day. His success with the stage led him to write several plays; and he continued to compose verse, publishing *Songs and Ballads* (1839). In 1844 he devised an entertainment of songs, recitations, and stories, called Irish Evenings, which he performed with much success in England, Canada, and the United States. His last years were devoted mostly to song writing. He died at St. Helier, July 6, 1868. Consult: *Works,* with introduction and notes by O'Donoghue (6 vols., New York, 1900); *The Novels, Irish Legends, Plays, and Poems of Samuel Lover,* with an introduction by J. J. Roche (Boston, 1902); W. B. Bernard, *Life* (London, 1874); H. S. Krans, *Irish Life in Irish Fiction* (New York, 1903).

LOVERE, lō-vā'rā. A city of Italy. See Iseo, Lake.

LOVERING, lŭv'ēr-ĭng, Joseph (1813–92). An American scientist, born in Boston. He graduated in 1833 at Harvard, where, five years later, he was made Hollis professor of mathematics and natural philosophy. This chair he held until 1888, when he was appointed professor emeritus, after 50 years' service in the faculty. He was acting regent of the university (1853–54) and succeeded Felton as regent. He was director of the Jefferson Physical Laboratory from 1884 to 1888, and was associated with the Harvard Astronomical Observatory, especially in the joint observations of the United States and the London Royal Society on terrestrial magnetism. In 1873 he served as president of the American Association for the Advancement of Science. He contributed to numerous scientific publications, prepared a volume on *The Aurora Borealis* (1873), and edited a new edition of Farrar's *Electricity and Magnetism* (1842).

LOVER'S PROGRESS, The. A play by Fletcher and Massinger, printed in 1647. The play, founded on Daudiguier's novel, *Lysandre et Caliste,* was altered from one "long since writ," no doubt the *Wandering Lovers,* licensed in 1623. It is identical with *Cleander,* 1634, and was probably entered in the Stationer's Register in 1653 under the title *The Wandering Lovers, or the Painter.*

LOVE'S LABOUR'S LOST. A comedy by Shakespeare, printed in 1598. The earliest of Shakespeare's dramatic works, it was written probably in 1590. The source is unknown, and the plot apparently not borrowed. The comedy was revised for a court entertainment in 1597 as "A pleasant, conceited comedy called 'Love's Labour's Lost,' as it was presented before Her Highness this last Christmas. Newly corrected and augmented by W. Shakespeare." This proves that an earlier version existed, and is the first time that Shakespeare's name appears on the title-page of a play.

LOVE'S LAST SHIFT; or, The Fool in Fashion. A comedy by Colley Cibber (1695), of which Vanbrugh's *Relapse* was an extension.

LOVES OF THE ANGELS. A poem by Thomas Moore (1822). The subject is the same as Lamartine's *Chute d'un ange.*

LOVE'S PILGRIMAGE. A romantic comedy by Fletcher, written probably in 1612, printed in 1647. The plot was taken from Cervantes' novel *Las dos doncillas.* The first part is an alteration of Jonson's *New Inn,* and some help may have been given by Webster. Fleay considers the comedy the same as the *History of Cardenio,* or the lost play *Cardano,* which Bullen denies.

LOVETT, Edgar Odell (1871–). An American mathematician. He was born at Shreve, Ohio; was educated at Bethany (W. Va.) College (A.B., 1890); and received the degree of Ph.D. from the University of Virginia (1895) and from Leipzig (1896). He was professor of mathematics at West Kentucky College (1890–92) and he lectured on mathematics at the universities of Virginia and Chicago in 1897. He then joined the faculty of Princeton University, where he was instructor (1897), assistant professor (1898–1900) and professor of mathematics (1900–05), and professor of astronomy (1905–08). In the latter year he became president of Rice Institute at Houston, Tex.

LOVETT, Robert Scott (1860–). An American railroad president, born at San Jacinto, Tex. He was admitted to the bar in 1882 and then served as attorney for various railroad interests. From 1904 to 1909 he was general counsel, and after 1909 president, of the Harriman system of railroads. He was compelled to dissolve the Southern Pacific and Union Pacific railroad merger in 1913. In 1914 he accepted directorships in the New York Central and Nickel Plate railroads.

LOW, Albert Peter (1861–). A Canadian surveyor and geologist. Born in Montreal, he was educated at McGill University. He entered the service of the Canada Geological Survey in 1881, and 10 years later was promoted to be geologist. He was engaged continuously in exploring the Labrador peninsula (now Ungava) in 1892–99, his surveys being used in delimiting the northern boundary of the Province of Quebec. He had charge of the Canadian mineral exhibit at Paris (1900); located valuable iron deposits on Hudson Bay (1901–02); and commanded the Arctic expedition on the *Neptune* to take possession of the Arctic islands for Britain (1903). He became director of the Canada Geological Survey (1906), and Deputy Minister of Mines in 1907. He was awarded the Gill memorial prize of the Royal Geological Society (England) for his services to geological science (1896), and was elected vice president of the Geological Society of America and of the Canadian Forestry Association.

LOW, A(lfred) Maurice (1860–). An Anglo-American journalist and writer on economic subjects. He was born in London and was educated there at King's College, and studied also in Austria. He became the American correspondent of the London *Morning Post,* and was also writer on American topics for the London *National Review* after 1896. He made investigations into English labor legislation in 1900, and into English trade-unions and industry in 1903 for the United States government. He is author of *The Supreme Surrender* (1901); *Protection in the United States* (1904); *American Life in Town and Country* (1905); *A Short History of Labor Legislation in Great Britain* (1907); *America at Home* (1908); *The American People: A Study in National Psychology* (2 vols., 1909–11); *The Real Truth about Germany* (1914).

LOW, Mary Fairchild (1866–). An American figure, landscape, and portrait painter, who married Frederick MacMonnies (q.v.) in 1888 and Will H. Low (q.v.) in 1909. She was born at New Haven, Conn., and studied at the St. Louis Art School (where she won a three years' scholarship), and in Paris at the Académie Julian and under Carolus Duran. Her works include groups of nudes or modern figures painted in the open air and sunlight with dainty charm, as well as landscapes and portraits surrounded by graceful accessories. Among her later paintings are: "The Green Butterfly"; "Early Morning Flower Market" (1910); "Christmas Eve in the Studio" (1911); "Little Women" (1911); "Portrait of W. H. Low" (1911); "Dogwood in Bloom" (1912); "Portrait of E. S. D." (1913). She is represented in the Museum of Rouen, France, where she won a gold medal in 1903 and again in 1911. She also won a gold medal at Dresden in 1902, at Marseilles in 1905, and the Julia Shaw prize of the Society of American Artists in 1902. She became an associate of the National Academy of Design.

LOW, Sampson (1797–1886). An English publisher, born in London. In 1837 he was made manager of the new trade journal, *The Publisher's Circular,* which became his own property in 1867, and which was the basis of his *British Catalogue,* beginning in 1853. His publishing house was opened in 1848. He compiled: *Low's Comparative Register of the House of Commons, 1827 to 1841, and 1841 to 1847* (2 vols., 1841 and 1847); an *Index to Current Literature* (1859–60); *Low's Literary Almanack* (1873). He also issued the *English Catalogue* (1753–82). His two sons, Sampson (1822–71) and William Henry (?–1881), took an active share in the business of the firm.

LOW, Seth (1850–1916). An American educator and publicist. He was born in Brooklyn; graduated at Columbia College in 1870; and entered the tea-importing house founded by his father in New York. In 1875 he was admitted a member of the firm, from which, upon its liquidation in 1888, he withdrew with a large fortune. From 1882 to 1886 he was mayor of Brooklyn, being twice elected on an independent ticket. His administration was characterized by his application of the civil-service system to city offices and the impartial maintenance of efficient service among appointees. Elected in 1890 to succeed Dr. F. A. P. Barnard (q.v.) in the presidency of Columbia College, he succeeded by administrative skill in transforming the institution. He increased the college proper in resources, attendance, and general reputation; transferred the site of the institution to valuable property on Morningside Heights; and vitally united the various schools into a university. (See Columbia University.) The Low Memorial Library at Columbia, architecturally one of the finest buildings in the country, was erected by Mr. Low at the cost of $1,000,000. His administration came to an end in 1901, when he resigned the presidency of the university, being succeeded by Nicholas Murray Butler (q.v.). In 1897 he had been an independent candidate for mayor of New York City. He was a member of the American delegation to the Peace Conference at The Hague in 1899, and in 1901, when the revolt against Tammany Hall had become general, he was elected mayor of New York on a fusion ticket. In 1903, as a candidate for reëlection, he was defeated by George B. McClellan (q.v.). At various times he served as president of the Archæological Institute of America, the American Asiatic Society, the American Geographical Society, and the National Civic Federation. From 1881 to 1914 he was a trustee of Columbia. Honorary degrees were given him by Amherst, the University of the State of New York, Harvard, the University of Pennsylvania, Trinity, Princeton, Yale, Edinburgh, Columbia. In 1914 he was head of a commission named by President Wilson to settle the Colorado miners' strike, and the next year he served as delegate at large to the State Constitutional Convention.

LOW, Sidney (James Mark) (?–). An English author and journalist, educated at Balliol College, Oxford. He became a barrister of the Inner Temple. After the *St. James's Gazette* was sold to Steinkopf he succeeded Frederick Greenwood as editor, and held this post until 1898, when he became a leader writer on the *Standard,* of which he was literary editor in 1904 and special correspondent thereafter. His *Dictionary of English History* (1884) reached a seventh edition in 1910, but he is perhaps better known by his *Governance of England* (1904; revised, 1914). He also wrote *A Vision of India* (1907), the outgrowth of his trip to India at the time of the Prince of Wales's tour; *History of England during the Reign of Queen Victoria* (1907); a brief biography of De Quincey (1911); *Egypt in Transition* (1914).

LOW, Will Hicok (1853–). An American illustrator, figure and genre painter. He was born May 31, 1853, at Albany, N. Y. His early education was interrupted by ill health, but in 1870 he went to New York and for two years illustrated for different magazines. He went to Paris in 1873, studying with Gérôme at the Ecole des Beaux-Arts, and later with Carolus Duran. His work was also influenced by association with Millet and other painters at Barbizon. Returning to America in 1877, he was elected member of the Society of American Artists in 1878 and an Academician in 1890, and for a time was instructor of the life classes at the Academy and in the schools of Cooper Union. In 1910 he delivered the Scammon lectures at the Art Institute, Chicago, published under the title *A Painter's Progress* (1910). He worked with John La Farge in glass painting, and received a second-class medal at the Paris Exposition in 1889 and medals at Chicago in 1893 and Buffalo in 1901.

Low is best known by his illustrations for periodicals, his decorative work for public buildings and private houses, and his stained glasses. He was one of the first to introduce the light tones of the open-air school into American art. His work shows grace of line, delicate color, and good composition. His ideal subjects of gods and nymphs are painted with great charm of color reflections in light and shade. Among his works are: "Portrait of Albania" (1877); "May Blossoms" (1888, Smith College, Northampton, Mass.); "My Lady" (Lotos Club, New York); "Aurora" (1894, Metropolitan Museum, New York); "The Orange Vendor" (Art Institute, Chicago); "Christmas Morn" (National Gallery, Washington). Among his decorations are: "Mother and Child," stained-glass window (Rock Creek Church, Washington); 10 stained-glass windows for St. Paul's Methodist Episcopal Church, Newark, N. J.; decorative panels in the Waldorf-Astoria Hotel, New York; and mural paintings in the Essex County Court House, Newark, N. J., the Lucerne County Court House, Wilkes-Barre, Pa. (1908), the Federal Building, Cleveland, and St. Paul's Church, Albany, N. Y. (1910). In 1914 he was engaged on mural paintings for the rotunda of the New York State Educational Building and for the Legislative Library in the Capitol at Albany. His best-known illustrations are those for Keats's *Lamia* and *Odes and Sonnets.* He is author of *A Chronicle of Friendships, 1873–1900* (New York, 1908), a book of reminiscences, and of many magazine articles on artistic subjects. He married as his second wife Mary Fairchild MacMonnies. (See Low, Mary Fairchild.)

LOWAN, lō′*a*n. See Mound Bird.

LOW ARCHIPELAGO. See Tuamotu.

LOW′BEY. The so-called gypsies of northwest Africa, a branch of the Fulahs (see Fulah), wandering about and accepting the laws and religion of their adopted homes.

LOW COUNTRIES. An English equivalent of Netherlands as formerly comprised, approximately, in the modern kingdoms of the Netherlands and Belgium and the Grand Duchy of Luxemburg.

LOW′DER, Charles Fuge (1820–80). An English clergyman, famous for his successful work among the poorest classes of London. He was born at Bath; graduated at Oxford in 1843; joined the mission of St. George's in the East, London (1856); became vicar of St. Peter's, London Docks (1866); and died at Zellam See, Austrian Tirol. His story is told by himself in *Twenty-One Years in Saint George's Mission* (London, 1877) and in his biography (ib., 1882).

LÖWE, lẽ′v*e*, Ferdinand (1865–). An Austrian orchestral conductor, born in Vienna. He was educated at the Vienna Conservatory (pupil of Bruckner) and from 1883 to 1896 was a teacher of piano and choral singing at that institution. During the season of 1897–98 he directed the famous Kaim Orchestra of Munich. In 1900–04 he was conductor of the Gesellschaftskonzerte, resigning this post when the conductorship of the newly founded Konzertverein was offered to him. Under his direction the new society rapidly rose to a position of great importance.

LOWE, lō, Sir Hudson (1769–1844). A British general, Governor of St. Helena during the captivity of Napoleon I. He was born at Galway, Ireland, July 28, 1769. His childhood was spent in the West Indies, where his father held a military appointment. Having entered the army, he served in Corsica, and subsequently at Lisbon and in Minorca. On the renewal of the French War, after the Peace of Amiens, he was appointed to the chief military command in the island of Capri. Unsupported, he was obliged to surrender to the French, Oct. 16, 1808. He afterward served with distinction under Blücher. His knighthood followed his adventurous ride, with one attendant, when he brought the first news to London of the fall of Paris in 1814. On Aug. 23, 1815, he was appointed Governor of St. Helena, with the rank of lieutenant general. He arrived there on April 14, 1816, Napoleon having been landed on the island in October of the previous year. He exercised very careful vigilance against the intrigues of Napoleon and his staff. On the death of Napoleon, Lowe returned to England. In 1822 Barry Edward O'Meara, who had been physician to Napoleon at St. Helena, published *Napoléon in Exile,* a libelous arraignment of

Lowe for his severity towards the prisoners. Lowe took legal action against O'Meara, but the physician was discharged on technical grounds. In 1825 Lowe was appointed military commander in Ceylon, whence he returned to England in order to refute the adverse criticism of him suggested in Scott's *Life of Napoleon*. He died in London, Jan. 10, 1844, in comparatively poor circumstances.

Bibliography. O'Meara, *A Voice from Saint Helena* (London, 1882); William Forsyth (ed.), *History of the Captivity of Napoleon at Saint Helena, from the Letters and Journals of Sir Hudson Lowe* (3 vols., ib., 1853); R. C. Seaton, *Sir Hudson Lowe and Napoleon* (ib., 1898); Lord Rosebery, *Napoleon, the Last Phase* (New York, 1900); R. C. Seaton, *Napoleon's Captivity in Relation to Sir Hudson Lowe* (London, 1903); J. H. Rose, *Napoleonic Studies* (ib., 1904). From Lowe's papers E. Reiss wrote *Der sterbende Napoleon* (2d ed., Berlin, 1911).

LOWE, JOHN (1750–98). A Scottish poet, born at Kenmure, East Galloway, in Scotland, being the son of a gardener. In youth he was a weaver's apprentice, but later (1771–73) he studied the classics at Edinburgh University, and theology, while supporting himself by private teaching. He took orders in the Church of England. He is best known as the author of a lyric entitled "Mary's Dream." He emigrated to the United States in 1773 and became a tutor to the family of a brother of George Washington. He married the sister of a beauty who had jilted him and died unhappy. Consult Thomas Bayne, in *Dictionary of National Biography*, vol. xxiv (London, 1893).

LÖWE, KARL and WILHELM. See LOEWE.

LOWE, ROBERT, VISCOUNT SHERBROOKE (1811–92). An English statesman. He was born Dec. 4, 1811, at Bingham, Nottinghamshire, and was educated at Winchester School and at University College, Oxford. He became known as a debater, and later was elected a fellow of Magdalen College. Admitted to the bar in 1842, he immediately went to Australia and soon took a leading part in the political struggles of the colony. In 1843 he was nominated to a seat in the Legislative Council of New South Wales, and won renown as a leader in educational and financial questions, as an opponent of the existing land monopoly and of the policy of sending convicts to Australia. He amassed a large fortune, and in 1850 he returned to England with the design of entering upon a parliamentary career. He immediately became an important contributor to the London *Times*, was elected to Parliament for Kidderminster in 1852, and in the same year became joint secretary of the board of control, but lost this office with the fall of the Aberdeen ministry in 1855. Nevertheless he was soon reinstated, and in 1859 became virtual Minister of Education in Lord Palmerston's administration, but resigned in 1864 on account of a censure voted by the House of Commons through a misunderstanding of his actions. His emancipation from the restraints of office exhibited Lowe in a new phase. No speaker in Parliament, during the session of 1865, was so logical, so original, and so daring. In 1866, on the introduction of the Whig Reform Bill, Lowe delivered a series of powerful speeches, which largely contributed to its rejection. He was offered, together with the other Adullamites (q.v.), a post in the Derby government, but he declined to leave the Liberal party, though describing himself as an outcast from it. When the Derby government in 1867 attempted to deal with the reform question, Lowe, in a series of speeches, vindicated his consistency as an opponent of all extension of the suffrage. In 1868 Lowe's feud with the Liberal party was forgotten in the strenuous aid he gave to resolutions in the House of Commons for the disestablishment of the Irish church. Accordingly in December of that year, when a general election brought the Liberal party into power, with Gladstone as Prime Minister, Lowe was appointed Chancellor of the Exchequer. In September, 1873, he became Home Secretary. He was Home Secretary for too short a period to test his fitness for that trying office. As Chancellor of the Exchequer, Lowe's chief reforms were the substitution of license duties for the assessed taxes, a change in the time of collecting the income tax, and a great reduction of the sugar duties. With the fall of the Gladstone ministry in 1874 Lowe ceased to occupy a prominent public position, though he still spoke at times. In 1880 he was raised to the peerage as Viscount Sherbrooke. Lowe's oratory was deficient in passion; but in acuteness, in felicity of illustration, in force of sarcasm, and in cogency of argument, he was almost unequaled among the public speakers of his day. He died at Warlingham, Surrey, July 27, 1892. For his Australian career, consult Sir Henry Parkes, *Fifty Years in the Making of Australian History* (London, 1892), and J. F. Hogan, *Robert Lowe, Viscount Sherbrooke* (ib., 1893). His career in England may be studied in Hansard, *Parliamentary Debates*, and A. P. Martin, *Life and Letters of Robert Lowe . . . Viscount Sherbrooke* (ib., 1893).

LOWE, THADDEUS S. C. (1832–1913). An American inventor and aëronautical engineer, born at Jefferson, N. H. He constructed balloons in 1856 and 1858–59 in order to study air currents; invented several aërostatic instruments, including an altimeter; in 1858 built the largest aërostat up to that time; and in 1861 he made a balloon trip of 900 miles. During the Civil War, while chief of the United States aëronautic corps, he made valuable observations for the army. His inventions include a machine in which he made the first artificial ice in the United States (1865), metallurgical furnaces for gas and oil fuel (1869–72), and the water-gas apparatus (1873–75). In the Sierra Madre Mountains, California, he built (1891–94) the railway up Mount Lowe, which had been named for him, and established an observatory. After 1897 he put into operation the new Lowe coke-oven system.

LOWELL, lō′el. An important manufacturing city and one of the county seats of Middlesex Co., Mass., 26 miles by rail northwest of Boston, at the junction of the Merrimac and Concord rivers, and on the Boston and Maine and the New York, New Haven, and Hartford railroads (Map: Massachusetts, E 2). The city has an area of 14 square miles. It is regularly laid out and has many points of interest, including the Ladd and Whitney Monument, Fort Hill Park, Pawtucket Falls, Rogers Street stone-arch bridge, the city hall, Memorial Building, high school, St. Anne's Church, and the great industrial establishments. Among the institutions are a State normal school, the Lowell Textile School, Rogers Hall School, a public library of 93,000 volumes, St. John's Hospital, Lowell

Hospital, Lowell General Hospital, Chelmsford Street Hospital (city), Old Ladies' Home, and Ayer Home for Young Women and Children.

Lowell is one of the greatest textile-manufacturing cities in the United States. It derives immense water power from the falls of the Merrimac River (32 feet), 30,000 horse power being developed through a system of 7½ miles of canals. Work on an 18-foot channel to the sea is now (1915) under way. The State has appropriated $1,000,000 for the project. Power afforded by the Concord River is also utilized by several mills, though steam is largely employed in many important plants. The textile establishments include cotton, woolen, worsted, knitting, hosiery, felt, and carpet mills, and bleaching and dyeing works. Other extensive manufactures are cartridges, machinery, various kinds of tools, electrical goods, rubber goods, foundry and machine-shop products, and patent medicines. The city has adopted the commission form of government, the power being vested in a mayor and four commissioners. The schools are under the supervision of a committee of five members. Lowell's income in 1912–13 was $4,235,000; while its expenditures amounted to $4,174,000, the chief items being $455,000 for education, $174,000 for fire department, $148,000 for police department, and $113,000 for water-supply system. The city owns and operates the water works, which were built in 1873 at a cost of $2,850,000, the entire system now containing 1000 driven wells, and having a daily capacity of 14,000,000 gallons. Pop., 1830, 6474; 1850, 33,383; 1870, 40,928; 1890, 77,696; 1900, 94,969; 1910, 106,294, including 43,457 persons of foreign birth and 133 negroes; 1914 (U. S. est.), 111,004; 1920, 112,759.

Lowell was founded by the Merrimack Manufacturing Company in 1822, and named after Francis C. Lowell (q.v.). The village grew very rapidly from the first. In 1826 it was incorporated as a town and 10 years later was chartered as a city. Consult: Old Resident's Historical Association, *Contributions*, vols. i–vi (Lowell, 1879–1904); Alfred Gilman, "Lowell," in S. A. Drake, *History of Middlesex County*, vol. ii (Boston, 1880); Charles Cowley, *Illustrated History of Lowell, Massachusetts* (Lowell, 1897); G. F. Kenngott, *The Record of a City: A Social Survey of Lowell, Mass.* (New York, 1912).

LOWELL, A(BBOTT) LAWRENCE (1856–). An American university president and authority on government. He was born in Boston, a brother of Percival Lowell, and graduated at Harvard in 1877 and at the Harvard Law School in 1880, then practicing his profession in Boston until 1897. After that date he was connected with Harvard, as lecturer on government (1897–99); professor of the science of government (1900–03); Eaton professor (1903–09); and president of the university, succeeding Charles W. Eliot (q.v.). President Lowell thoroughly reorganized the financial administration of the university. He became a trustee of Lowell Institute, Boston, and of the Carnegie Foundation for the Advancement of Teaching, and was elected a member of the American Academy of Arts and Letters, corresponding member of the British Academy, and honorary member of the Royal Irish Academy. Honorary degrees were given him by Williams, Columbia, Princeton, Yale, Louvain, Dartmouth, Berlin, and Brown. His publications include: *Transfer of Stock in Corporations* (1884), with F. C. Lowell; *Essays on Government* (1889); *Governments and Parties in Continental Europe* (2 vols., 1896; abridged and revised as *The Governments of France, Italy, and Germany,* 1914), recognized as the best single work in English on the European governments; *Colonial Civil Service* (1900), with H. M. Stephens; *The Influence of Party upon Legislation in England and America* (1902); *The Government of England* (2 vols., 1908).

LOWELL, CHARLES (1782–1861). An American minister. He was born in Boston, studied at Andover, and graduated at Harvard in 1800; he studied law and afterward theology, spending two years in Edinburgh. From 1806 to his death he was connected with the West Church (Congregational) in Boston for about 30 years as active pastor. When the controversy between the orthodox Congregationalists and the "liberal" or Unitarian element arose he refused to join either party, or to take a sectarian name, and did what he could to prevent a division. His church became Unitarian. His health declining, after 1837 he preached only occasionally. He was an able rather than a learned speaker, and was a zealous opponent of slavery. He published two volumes of sermons (1855) and devotional books. He was the father of James Russell Lowell and Robert Traill Spence Lowell.

LOWELL, CHARLES RUSSELL (1835–64). An American soldier. He was born in Boston; graduated at Harvard in 1854; spent some time in Europe; engaged in business on his return; and in 1861, soon after the outbreak of the Civil War, entered the Federal army. He served throughout the Peninsular campaign, as captain on General McClellan's staff. He then organized the Second Massachusetts Cavalry, of which he became colonel in April, 1863; and subsequently, as commander of a cavalry brigade, he fought various engagements with Mosby's Confederate troops and served with marked efficiency under Sheridan in the Shenandoah valley. For services in this latter campaign he was promoted to be brigadier general in October, 1864. Early in the battle of Cedar Creek he was wounded, but refused to retire from the field, and in the moment of victory received additional wounds which proved fatal.

LOWELL, EDWARD JACKSON (1845–94). An American historian. He was born in Boston, Mass., and graduated at Harvard in 1867. After several years spent in study and travel in Europe he returned to America and began the practice of law in Boston, finally abandoning his profession to devote himself to literary work. His first published work of importance—exhaustive, and still regarded as authoritative—was *The Hessians and Other German Auxiliaries of Great Britain in the Revolutionary War* (1884). Among his other publications are: *The Eve of the French Revolution* (1892); the chapter on "Diplomacy of the American Revolution," in Winsor, *Narrative and Critical History of America* (Boston, 1886–89); and numerous magazine and review articles.

LOWELL, FRANCIS CABOT (1775–1817). An American merchant and manufacturer, the founder of the cotton-manufacturing industry in America. He was born in Boston, the son of Judge John Lowell (q.v.), graduated at Harvard in 1793, and entered upon a mercantile career in Boston. While traveling in England he became convinced that cotton manufacture could be profitably carried on in America, and during the War of 1812, when the necessity for cotton cloth became pressing, he had cotton looms constructed from his own models and started some cotton mills, first at Waltham and later on the Merrimac River at a place since named Lowell in his honor.

LOWELL, Guy (1870–). An American architect, born in Boston. He graduated from Harvard University in 1892, from the Massachusetts Institute of Technology in 1894, and from the Ecole des Beaux-Arts, Paris, in 1899. Taking up the practice of his profession at Boston in 1900, he was architect of the Museum of Fine Arts there, of the Cumberland County Court House at Portland, Me., and of the New Hampshire Historical Society Building at Concord. In 1913 his plans for the new courthouse of New York City were accepted over those of many noted architects. They provided for a circular building 500 feet in diameter, an interesting modification for twentieth-century metropolitan purposes of the Roman Coliseum, which Lowell had visited and studied carefully in 1912. He lectured at the Massachusetts Institute of Technology (1900–13) and edited *American Gardens* (1902).

LOWELL, James Russell (1819–91). A distinguished American poet, essayist, and diplomat. He was born at Cambridge, Mass., Feb. 22, 1819, and died there Aug. 12, 1891. His family had long been eminent in and about Boston, where his father, the Rev. Charles Lowell, was minister of a Unitarian church. Harvard College, where his male forebears on both the paternal and maternal sides of his family had been educated before him, he entered in his sixteenth year, and was poet of his class on its graduation in 1838. He entered the law school of the university, but though he finished the course, he found the profession uncongenial and never seriously practiced it. His bent towards a literary life would not be withstood. In 1841 he published his first volume of poems, *A Year's Life.* This was followed, in 1844, by a collection of poems, including the "Legend of Brittany" and other academic pieces in the style of Keats. The same year he married Maria White (see Lowell, Maria (White)), of Watertown, Mass., whose fine nature and earnestness quickened into action his own generous and humanitarian impulses. Mention should here be made of Lowell's editorial labors on *The Pioneer, a Literary and Critical Magazine,* which was published for a few months in 1843 with Lowell and Robert Carter as editors. It assembled an extraordinarily gifted company of contributors, among them Poe, Hawthorne, Whittier, and Elizabeth Barrett (afterward Mrs. Browning), but was soon involved in the failure of its publishers. In 1846 he printed in the Boston *Courier* the first of the *Biglow Papers,* published in book form in 1848, a series of satirical poems directed against the Mexican War. The Yankee dialect verse used in them became immediately popular, and Lowell began to win wide recognition. Besides his poems he had already published *Conversations on Some of the Old Poets* (1845), a series somewhat antique in form, but marked by unmistakable critical ability. In 1848 he increased his reputation by "A Fable for Critics" (anonymously published), a rambling poem, full of brilliant wit and striking puns, and also keen critical judgments of contemporary writers then just rising into fame, such as Emerson, Hawthorne, Poe, and others. The same year appeared a volume of miscellaneous poems, and also "The Vision of Sir Launfal," which is perhaps his most popular poem. Lowell's European sojourn of 1851–52, with his study of Italian art and literature in Italy, was turned to good account in his essay on Dante in *Fireside Travels* and elsewhere. It had been undertaken for the sake of Mrs. Lowell's health, but was of little benefit to her, and was saddened by the death of an infant son, Walter, who had been taken abroad with the family. In the autumn of 1852 Lowell returned to America. In 1853 he suffered the greatest sorrow of his life in the death of his wife.

The period of his best prose work began about 1855, the year when he was appointed to succeed Longfellow as Smith professor of modern languages at Harvard College, a position which he held till 1877. In 1857 he married his second wife, the accomplished Miss Frances Dunlap, of Portland. The same year he became editor of the *Atlantic Monthly,* a post which he held until 1862. From 1864 to 1872 he was joint editor of the *North American Review.* In the pages of these magazines many of his best literary and critical essays appeared. They were printed in book form in *Fireside Travels* (1864), a series of descriptive and reminiscent sketches; *Among my Books* (1870); *My Study Windows* (1871); and the second series of *Among my Books* (1876). Meanwhile Lowell continued writing poetry. From 1862 to 1866 the *Atlantic* published the second series of the *Biglow Papers* (book form, 1867), stinging satires directed against the slavery party of the Civil War. In 1865 he delivered, at the memorial services in honor of Harvard students and graduates who had fallen in the war, his "Commemoration Ode," his most dignified and serious poem, considered by many one of the best American poems. Other volumes of verse were *Under the Willows* (1869); *The Cathedral* (1870); and *Three Memorial Poems* (1877), the last named containing the famous tributes to Lincoln, Washington, and America that make Lowell the most conspicuous poet of American patriotism. In 1876, be it said by the way, he was a presidential elector.

In 1877 Lowell was appointed Minister to Madrid by President Hayes, and in 1880 was transferred to London, where he served with distinction till 1885. While in England he delivered several admirable speeches, which were published later as *Democracy, and Other Addresses* (1887). In 1888 appeared his last volume of verse, *Heartsease and Rue,* and the same year a volume of *Political Essays.* The year after his death the 10 volumes of his revised and complete works were supplemented by his *Latest Literary Essays and Addresses,* and by a series of lectures which he had delivered in Boston in 1887, called *The Old English Dramatists,* both edited by Charles Eliot Norton. In addition to the volumes enumerated, Lowell edited the works of several English poets, as Keats (1854), Wordsworth (1854), Shelley (1857), and Donne (published 1895); he also edited, among other prose writings, the *Compleat Angler* of Walton (1889).

Lowell appears in American life and letters in many rôles. He is a poet, a critic, an essayist, a public speaker, a diplomat. His poetry is varied and uneven. His earlier verse is often imitative, academic, and sentimental. Much of his later work is more serious in spirit and more genuine in feeling, yet often exceedingly uneven in both form and inspiration. The explanation is that most of Lowell's verses, aside from the rather conventional poems of sentiment, were written for immediate effect, as with a view to reform, and the native weapons of abundant humor, a rich and varied vocabulary, and a wealth of imagery made a rapid, unstudied expression best suited to his purposes, and rendered him most effective with his readers. As a poet, he is essentially vigorous, richly endowed with wit and humor, writing with very little conscious artistic sense. He is indeed one of the foremost of American poets, but he gains his place and reputation, not by the artistic and agreeable phrasing of common sentiments dear to the heart of the people, as Longfellow; nor as Emerson, by depth and isolation; nor as Poe, by unrivaled sense of form; nor as Bryant, by dignity; nor as Whittier, by fervor; but through the native vigor of his expression and the sound common sense of his ideas. He has produced some of the best verse that has appeared from the hand of any distinguished American, and he has also produced some of the worst. Among the most even and excellent of his poems are "The Vision of Sir Launfal," "She Came and Went," "The First Snowfall," "After the Burial," and the "Commemoration Ode." Among the most characteristically humorous are some of the verses from the *Biglow Papers*, as "The Courtin'," "A Fable for Critics," and "In the Half-Way House." Undoubtedly the most original and effective poetry he ever wrote is to be found in the *Biglow Papers*, which combine shrewd satire, sound political judgment, and hearty patriotism to an extent rarely paralleled in literature. The *Memorial Poems*, though less racy and original, are scarcely less effective.

Lowell is probably better known as a prose writer than as a poet. His prose groups itself mainly in the three classes of critical essays, descriptive and reminiscent sketches, and political lectures and addresses. As a critic, Lowell had in his day no serious rival among his countrymen. He was a man of wide and thorough reading, and in the course of his life became acquainted with all that is best in the literatures of Europe. His wide reading was supplemented by an excellent memory and by a genuine enthusiasm for literature. His work as a critic came at a time in the history of American letters when deeper interest was awakening in art and scholarship. Longfellow had previously done a great service to his country by arousing it to an appreciation of the beauty, the traditions, and the culture of Europe. The work of Lowell, in a way, supplemented this. He interpreted for his public the spirit of authors then not widely read in America. His essays on Dante, Shakespeare, Chaucer, Dryden, and other poets, the main facts of whose lives and whose significance have now become literary commonplaces, were a new and fresh handling of delightful subjects. The temper in which these essays were written was not that of the contemporary accumulative study of literature, but of an enthusiastic attempt to enter into the spirit of these men and expound their significance. The personality of Lowell, though not obtrusive, is so constantly present, and imparts to the essays so original and agreeable a flavor, that they may be called literature as justly as criticism. The specific ideas and details are often very elusive and are easily forgotten, there is little grasping of principles to be afterward applied, but the impression of the author and his attitude remain. Indeed, it may probably be said that although Lowell is scarcely a great critic in the radical sense of that term, few writers have excelled him in conveying to readers a sense of the flavor of the best books and of the personality of their authors.

The sketches and political writings are of less importance. The former comprise such essays as *A Moosehead Journal*, *Leaves from my Journal in Italy and Elsewhere*, *Cambridge Thirty Years Ago*, *My Garden Acquaintance*, and *A Good Word for Winter*. *On a Certain Condescension in Foreigners* is a dignified and emphatic protest against the attitude of Europeans towards the United States. The essay is perhaps the clearest expression of Lowell's patriotism. Its mood is that of a believer in his country. He was no blind worshiper of numbers or of the power of the masses, but he had faith in the nobility of the founders of America and enthusiasm for institutions capable of producing men of the temper and character of Lincoln and Emerson. Such also is the attitude underlying the political addresses and essays, published in the volumes entitled *Democracy* and *Political Essays*. His address on *Democracy*, delivered at Birmingham, England, in 1884, has scarcely been surpassed for lofty faith in mankind, combined with keen insight into the nature and functions of government.

The manner of Lowell, alike in poetry and prose, is difficult and uneven. His prose is often charged to the point of turgidity with literary and historical allusion and reference. His early prose seems to be the outpouring of a full mind, often provokingly unaware of its superfluity. Towards the end of his life, as in *The Old English Dramatists*, his style became more terse, and these essays are much more simple and straightforward, and the superabundant brilliance of figure is much more restrained, but they are rather a series of interesting thoughts about the subject in hand cast into a semblance of unity. Consequently the essays are difficult to grasp as connected wholes, and are frequently more memorable for their brilliancy of detail than for sustained intellectual power. In the main, however, no American critic has had so much influence as he, and in occasional power and insight he may be placed with the most eminent of his critical contemporaries.

Bibliography. The best edition of the complete works of Lowell is the Riverside (11 vols., Boston, 1899). The letters have been edited in two volumes by Charles Eliot Norton (New York, 1894). Consult: E. C. Stedman, *The Poets of America* (11th ed., Boston, 1892); F. H. Underwood, *The Poet and the Man: Recollections of James Russell Lowell* (ib., 1893); Henry James, *Essays in London and Elsewhere* (New York, 1893); C. F. Richardson, *American Literature, 1607–1885* (ib., 1893–94); E. E. Hale, *James Russell Lowell and his Friends* (Boston, 1899); W. D. Howells, *Literary Friends* (New York, 1900); H. E. Scudder, *James Russell Lowell* (2 vols., Boston, 1901); Ferris Greenslet, *James Russell Lowell: His Life and Work* (ib., 1905); G. W. Cooke (comp.), *Bibliography of James Russell Lowell* (ib., 1906); Barrett Wendell, *Literary History of America* (4th ed., New York, 1907); W. C. Brownell, *American Prose Mas-*

ters (ib., 1909); W. H. Hudson, *Lowell and his Poetry* (ib., 1912); L. S. Livingston (comp.), *Bibliography of the First Editions in Book Form of the Writings of James Russell Lowell* (ib., 1914); Gustav Pollok, *International Perspective in Criticism* (ib., 1914); J. J. Reilly, *Lowell as a Critic* (ib., 1915).

LOWELL, John (1743–1802). An American jurist. He was born at Newburyport, Mass.; graduated at Harvard in 1760; was admitted to the bar in 1762; and rapidly attained prominence in his profession. He was an enthusiastic patriot, took an active part in the pre-Revolutionary movement in Massachusetts, and after the outbreak of hostilities served for a time as a lieutenant of Massachusetts militia. In 1776 and again in 1777 he was elected from Newburyport to the Provincial Assembly. In 1780 he was a delegate to the State Constitutional Convention and took a prominent part in drafting the constitution which was adopted. He is said to have been the author of the declaration in this instrument that "all men are born free and equal," which was held by the State Supreme Court in 1783 to have abolished slavery in Massachusetts. In 1782–83 he was a member of the Continental Congress and in 1782 was appointed by that body one of the three judges to try appeals from the local courts of admiralty. In 1784 he was a member of the New York-Massachusetts Boundary Commission, and in 1789 was appointed by President Washington the first judge of the United States District Court in Massachusetts, which office he held until his death.

LOWELL, John (1769–1840). An American political pamphleteer, born at Newburyport, Mass. He graduated at Harvard in 1786; was admitted to the bar in 1789; took up his residence in Boston; became eminent as a lawyer; and was an active, honored, and public-spirited citizen, but refused to take office. He was the author of about 25 pamphlets upon the current topics of his time, including: *Peace without Dishonor—War without Hope* (1807); *Candid Comparison of the Washington and Jefferson Administrations* (1810); *Mr. Madison's War* (1812). He was for many years president of the State Agricultural Society, and for his interest and success in horticulture was known as "the Columella of the New England States."

LOWELL, John (1799–1836). An American philanthropist. He was born in Boston, the grandson of Judge John Lowell, was educated in Edinburgh, Scotland, and at Harvard, and spent the years 1816–17 in travel in India and the East. He was then engaged in commerce in Boston until 1831, when he retired from business and spent the rest of his life in study and travel. He was a man of literary culture, and at his death left a fund of $250,000 to found the famous Lowell Institute at Boston, which provides for annual courses of free lectures. Consult Edward Everett, *Memoir of John Lowell, Jr.* (Boston, 1840).

LOWELL, Josephine (Shaw) (1843–1905). An American philanthropist and author, born at West Roxbury, Mass. She was educated in New York, Boston, and Europe, and in 1863 married Col. Charles Russell Lowell, who was killed in the battle of Cedar Creek, Va., 1864. She was appointed by Governor Tilden Commissioner of the New York State Board of Charities and was reappointed by several succeeding governors, her period of service extending from 1877 until 1889. After retiring from the State board she engaged in other charitable works. She published *Public Relief and Private Charity* (1884) and *Industrial Arbitration and Conciliation* (1893). Consult W. R. Stewart, *Philanthropic Work of Josephine Shaw Lowell* (New York, 1911).

LOWELL, Maria (White) (1821–53). The first wife of James Russell Lowell, whom she married in 1844. She was born in Watertown, Mass., July 8, 1821, and died in Cambridge, Oct. 27, 1853. Mrs. Lowell is known in American letters for her writings against slavery, for her influence on her husband in the cause of abolition, and for the beauty and sincerity of her character. Her poems were privately printed in Cambridge in 1855.

LOWELL, Percival (1855–1916). An American traveler, astronomer, and author, brother of A. Lawrence Lowell, born in Boston. He was educated at the Boston Latin School and at Harvard University, from which he graduated in 1876. He then passed some years in Japan and Korea. In 1893 he returned to the United States and established the Lowell Observatory. In 1894 he was counselor and foreign secretary to the Korean Special Commission to the United States. In 1902 he was made nonresident professor of astronomy at the Massachusetts Institute of Technology. He made discoveries on the planets Mercury, Venus, Saturn, and, especially, Mars. It was his researches on Mars that brought him the Janssen medal of the French Astronomical Society in 1904, and for which in 1908 he was awarded a gold medal by the Sociedad Astronomica de Mexico. Among his publications are: *Chosön* (1885), a sketch of Korea; *The Soul of the Far East* (1886); *Noto, an Unexplored Corner of Japan* (1891); *Occult Japan, or the Way of the Gods* (1895); *Mars* (1895); *Annals of the Lowell Observatory* (1898–); *The Solar System* (1903); *Mars and its Canals* (1906); *Mars as the Abode of Life* (1908); *The Evolution of Worlds* (1909).

LOWELL, Robert Traill Spence (1816–91). An American clergyman and author. He was born in Boston, was educated at Northampton, Mass., and at Harvard, where he graduated in 1833, and then studied in Harvard Medical School. He engaged in mercantile pursuits, but began to study theology in 1839 and to prepare for the Episcopal ministry. On invitation of Bishop Spencer he went to Bermuda, where he was ordained priest and in 1843 appointed domestic chaplain to the Bishop. Later he was transferred to Newfoundland and was put in charge of the church at Bay Robert. He returned to the United States in 1847 and began mission work in Newark, N. J., where he organized a church. From 1859 to 1869 he was rector of Christ Church, Duanesburg, N. Y.; then became head master of St. Mark's School, Southborough, Mass., and in 1873 professor of the Latin language and literature in Union College. He published: *The New Priest in Conception Bay* (1858); *Fresh Hearts, and Other Poems* (1860); *Anthony Brade* (1874); *A Story or Two from an Old Dutch Town* (1878); *Burgoyne's March*, the poem of the Saratoga County centennial celebration at Bemis Heights, 1877. He was a brother of James Russell Lowell.

LOWELL INSTITUTE. An institution organized upon the bequest of $250,000 left by John Lowell (1799–1836) for "the maintenance and support of public lectures, to be delivered in Boston, upon philosophy, natural history, the arts and sciences, or any of them, as the trustees shall, from time to time, deem expedient for the promotion of the moral, and intellectual, and physical instruction and education of the citizens of Boston." The first lecture was delivered on Dec. 31, 1839, by Edward Everett, and the most prominent leaders in the fields of science, religion, philosophy, literature, art, history, and education, both in America and in England, have spoken for the institute. Besides the lecture series the institute has also conducted under its auspices special classes in drawing and science for school-teachers, and courses for workingmen in connection with the Wells Memorial Institute. The Lowell School of Practical Design, which gives a three-year course in drawing and weaving, was also instituted in 1872 by the same foundation for the promotion of industrial arts. By the terms of the bequest the general management is intrusted to one trustee, who must be a member of the Lowell family. The present trustee is A. Lawrence Lowell. Consult H. K. Smith, *History of the Lowell Institute* (Boston, 1898).

LÖWENBRÜGGER, lẽ′ven-brụg′ẽr, NIKOLAUS VON. See FLÜE, NIKOLAUS VON.

LÖWENDAL, lẽ′ven-däl, *Ger. pron.* lẽ′ven-dȧl, ULRICH FRIEDRICH WOLDEMAR, COUNT VON (1700–55). A marshal of France, great-grandson of Frederick III of Denmark. He was born at Hamburg and was educated at Dresden; entered the service of Augustus the Strong, Elector of Saxony and King of Poland; was made field marshal and inspector of infantry in the Saxon army (1732), and in 1733 defended Cracow against the attack of the Polish insurgents. For the next two years, during the War of the Polish Succession, he was in command of Saxon troops on the Rhine and then entered the Russian army, winning distinction in the campaigns against the Turks and Swedes. Having become a Catholic and entered the French army, he was made a lieutenant general and served in the Netherlands with great success. After taking Bergen-op-Zoom (Sept. 15–16, 1747), he was made marshal of France.

LÖWENTHAL, lẽ′ven-täl, JOHANN JAKOB (1810–76). An Hungarian-English chess player, born at Budapest. By 1841 he was recognized as one of the best chess players in Europe. In 1849 he went to the United States, where he met the chief players, including C. H. Stanley, Dudley, and Paul Morphy. In 1851 he went to London to take part in a chess tournament and became a resident of that city, where he was employed in editing the chess department of the *Era* and of the *Illustrated News of the World*. He also edited the *Chess-Player's Magazine* from 1863 to 1867. From 1865 to 1869 he was manager of the British Chess Association. In 1860 he published *Morphy's Games of Chess with Analytical and Critical Notes*, and in 1867–69 *Transactions of the British Chess Association*. Many of his games may be found in Walker's *Chess Studies* (London, 1894) and the *Chess-Player's Chronicle* as well as in his own *Chess-Player's Magazine*.

LOWER, lou′ẽr, RICHARD (1631–91). An English physiologist. He was born in Cornwall, was educated at Westminster School and Oxford, and studied medicine under Dr. Thomas Willis. In 1666 he went to London, where he eventually attained prominence in the practice of medicine and became a fellow of the Royal Society and of the College of Physicians. His anatomical and physiological researches, concerned chiefly with the structure of the brain and the process of direct transfusion of blood, have permanent value. His chief publication, containing the results of the above study, is the *Tractatus de Corde* (1669).

LOWER AMMONOOSUC. See AMMONOOSUC.

LOWER AUSTRIA (Ger. *Niederösterreich*, or *Oesterreich unter der Enns*, Austria below the Enns). An archduchy and crownland of Austria, occupying the eastern part of the original Archduchy of Austria—the nucleus of the Austrian Empire (Map: Austria-Hungary, D 2). It is bounded by Bohemia and Moravia on the north, by Hungary on the east, by Styria (the Semmering Alps) on the south, and by Upper Austria (the river Enns marking part of the boundary) and Bohemia on the west. Area, 19,825.2 square kilometers (7654.5 square miles). Capital, Vienna. Lower Austria is divided by the Danube, which traverses the district from west to east. The southern part belongs to the region of the Alps and slopes towards the Danube. The northern part is less mountainous and partakes of the character of the Bohemian and Moravian mountain systems. The southern portion abounds in picturesque river valleys. Among the tributaries of the Danube in the crownland are the Enns, Ybbs, Traisen, and Kamp. The March and the Leitha form part of the eastern border. There are numerous mountain lakes and mineral springs. The climate is generally moderate and agreeable. In 1910, of the total area of 1,982,524 hectares, arable land was reported to comprise 859,840 hectares; gardens, 31,268; vineyards, 35,705; meadows, pastures, etc., 298,961; woodlands, 681,091; lakes, marsh, etc., 1809; unproductive (untaxed), 73,667. The arable land in 1912 was stated at 859,430 hectares, of which wheat was planted to 79,814 hectares, rye 221,778, barley 68,436, oats 178,899, potatoes 89,848, sugar beets 17,326. The forests are very valuable, and lumber is an important article of trade. The mineral resources are small; they are restricted practically to coal and graphite. In 1911 the output of coal was 84,686 metric tons, lignite 39,867, and graphite 1057. Wild game figures rather conspicuously in the items of trade.

Lower Austria is a great industrial district. Vienna is, of course, the great centre of this activity. In the northern part of the crownland the house industry still prevails to a considerable extent.

The Diet is composed of 78 members, including the Archbishop of Vienna, the Bishop of Sankt Pölten, and the rector of the University of Vienna. The term of the elected members is six years. In the Lower House of the Austrian Parliament the crownland is represented by 64 members. The population increased from 2,661,799 in 1890 to 3,100,493 in 1900 and 3,531,814 in 1910 (census of December 31). The increase from 1881 to 1890 was 14.2 per cent; from 1891 to 1900, 16.4 per cent; and from 1901 to 1910, 13.9 per cent. Of the population in 1910, 2,031,498 were in Vienna. For each 1000 males there were 1046 females. Roman Catholics numbered 3,234,489 (91.58 per cent); Evangelicals (Augsburg), 79,895 (2.26); Evangelicals (Helvetian), 12,725 (0.36); Greek Orthodox, 5162 (0.15); Greek Catholic, 4955 (0.14); Jews, 184,779 (5.23). Of Austrian subjects numbering 3,264,110, 3,130,536 (95.91 per cent) were returned in 1910 as of German vernacular; Bohemian, Moravian, Slovak, 122,329 (3.75 per cent); Polish, 5601 (0.17). See Austria-Hungary; Vienna.

LOWER CALIFORNIA. See California, Lower.

LOWER CANADA. See Quebec.

LOWER EMPIRE. A name sometimes applied to the Byzantine Empire (q.v.).

LOWER FRANCONIA. See Franconia.

LOWER GANGES CANAL. See Ganges Canal.

LOWER HELDERBERG, hĕl′dẽr-bẽrg. The name given to a series of limestones that is prominently developed in the Helderberg Mountains of eastern New York, and that is also known to extend south along the Appalachians into Virginia and to occur in other sections. The prefix Lower is now often dropped, and the single word Helderberg or Helderbergian used, since the term Upper Helderberg, which was once applied to the limestones of a higher stratigraphic horizon, is no longer current. The Lower Helderberg series is divided into a number of stages, inclusive of the Coeymans, Kalkberg, New Scotland, and Becraft, named from localities in eastern New York, and has a thickness altogether of about 400 feet in New York and 600 feet in eastern Pennsylvania and in New Jersey. The beds thin down rapidly as they are traced to the west. The limestones are valuable for the manufacture of cement, lime, and for building stone. They contain an abundance of invertebrate fossils, many forms being typical of both the Silurian and Devonian systems, so as to cause some doubt as to the precise relations of the series. According to the recent classification, as adopted in the New York State geological survey, the Lower Helderberg is placed at the base of the Devonian. See Devonian System.

LOWER LAKE INDIANS. See Pomo.

LOWER RHENISH MUSICAL FESTIVAL (Niederrheinisches Musikfest). The most important triennial musical festival in the world. In 1811 a Thurginian musical festival was held at Erfurt under the conductorship of Bischoff, the organist of Frankenhausen. In 1817 Johann Schornstein, who was the musical director at Elberfeld, organized a festival in which he was assisted by the musicians of Düsseldorf. Originally the Lower Rhenish festivals were held at Elberfeld and Düsseldorf alternately, but in 1821 the musicians of Cologne participated, and the Musikfest was held in their city. In 1825 Aix-la-Chapelle was the city selected. With the single exception of 1827, when the festival was held at Elberfeld, the meetings have taken place at Düsseldorf, Aix-la-Chapelle, or Cologne. Among the conductors have been Spohr, Mendelssohn, Spontini, Hiller, Liszt, Rubinstein, Joachim, Gade, Brahms, Richter, R. Strauss.

LOWER SILU′RIAN. See Ordovician System.

LOWER TUNGUSKA. See Tunguska, Lower.

LOWES DICKINSON, G(oldsworthy). See Dickinson.

LOWESTOFT, lō′stŏft. A seaport in Suffolk, England, one of the most important fishing stations in that county, and a popular resort for sea bathing (Map: England, H 4). The town is picturesquely built on the slope of the most easterly height of England, which has a lighthouse at its summit and another at its base. The town possesses a parish church of the fourteenth century, a town hall containing some good stained glass, a county hall, two foundation schools, a hospital, and numerous charitable institutions. There are building yards, rope works, and oil and flour mills. Lowestoft has a spacious harbor and a large export trade in fish. South Lowestoft, with its long esplanade and its South and Claremont piers, is the watering place proper. Its importance as a fishing town dates from the Roman period. In 1643 Cromwell occupied the town, and in 1665 the Dutch were defeated off the harbor, with a loss of 18 ships. The production of the celebrated white and blue china was begun here towards the end of the eighteenth century, but it is now no longer made. Pop., 1901, 29,800; 1911, 33,777. Consult Nall, *History of Lowestoft* (London, 1866).

LOWICZ, lō′vĭch. A small town in Russian Poland, 50 miles west-southwest of Warsaw, on the right bank of the Bzura. It has a monastery, a handsome abbey church, an old château in a fine park, cavalry barracks, and a Gymnasium. It manufactures soap, candles, leather, and flour. In the vicinity are two palaces of the counts of Radziwill. Lowicz is first mentioned in 1136. About the middle of the fourteenth century it became the capital of the Principality of Lowicz. Pop., 1897, 12,400; 1912, 14,500. It was occupied by the Germans in the European War of 1914 during one of their drives on Warsaw. It was heavily fortified, with the idea of keeping a firm hold on this portion of Russian Poland. See War in Europe.

LOWIE, lō′ĭ, Robert Harry (1883–). An American anthropologist. He was born in Vienna, but early came to the United States and graduated from the College of the City of New York (A.B.) in 1901 and from Columbia University (Ph.D.) in 1908. For a year he was an assistant in the department of anthropology of the American Museum of Natural History, New York, and in 1909 he became assistant curator. He made expeditions to the Assiniboin, Chippewyan, Crow, and Shoshone Indians, and is author of papers on the folklore and mythology of the North American Indian, besides contributing to the New International Encyclopædia.

LOWNDES, lounz, Marie Adelaide Belloc (1868–). An English novelist, daughter of Louis Belloc, a French barrister. She was educated at Mayfield Convent in Sussex and in 1896 was married to Frederic Sawrey Lowndes. Her publications include: *Life and Letters of Charlotte Elizabeth, Princess Palatine* (1889); *Pages from the Journals and Correspondence of Edmond and Jules de Goncourt* (1894), with Miss Shedlock; *The Heart of Penelope* (1904); *The Uttermost Farthing* (1908); *Studies in Wives* (1909); *When No Man Pursueth* (1910); *Jane Oglander* (1911); *The Chink in the Armor* (1912); *The Lodger* (1913); *The End of her Honeymoon* (1914); *Told in Gallant Deeds* (1914).

LOWNDES, Rawlins (1722–1800). An American statesman. He was born in the West Indies, removed with his parents to Charleston, S. C., when very young, rose to eminence at the bar, and in 1766 became an associate judge of the Colonial Court, in which capacity in the same year he delivered the majority opinion of the court favoring the use of unstamped paper in contravention of the Stamp Act. He early took a decided stand against the aggressions of the British ministry and in 1775 became a member of the Council of Safety. In 1776 he helped draw up the new constitution for South Carolina, became a member of the Legislative Council, and in 1778 was elected President of South Carolina, assisting as such in the defense of Charleston in 1780 and becoming a prisoner upon the surrender of that city. After the close of the war he became a member of the State Legislature. When the Federal Constitution was submitted for ratification, he was one of its bitterest opponents, objecting especially to the provisions restricting the slave trade, enabling Congress to regulate commerce, and concentrating power in the hands of the Federal government.

LOWNDES, William (1782–1822). An American political leader and legislator. He was born in St. Bartholomew's Parish, Colleton Co., S. C.; was educated in England and at Charleston; studied law, and was admitted to the bar in 1804, but practiced for only a year; and then, having married the daughter of Thomas Pinckney, retired to his plantation. Allying himself politically with the Jeffersonian Republicans, he was in 1806 elected to the South Carolina Assembly and from 1810 until his death was a member of the National House of Representatives. As a member of the Committee on Military Affairs, he was a sharp critic of the administration's conduct of the War of 1812, opposed the confiscation of merchants' bonds, and voted with the Federalists on some questions. In 1814 he became chairman of the Committee on Naval Affairs, a position in which he strongly opposed privateering. In the session of 1815–16, as chairman of the Committee of Ways and Means, he drew up and secured the passage—with the support of Calhoun, but in the face of violent opposition from Southern agricultural interests—of the Tariff of 1816, which recognized the protective principle. At the first session of the Fifteenth Congress he secured the passage of his measure establishing a sinking fund. In 1819 he became chairman of the Committee on Foreign Affairs. He again declined the French mission, and on Dec. 18, 1821, was nominated for the presidency by the South Carolina Legislature—an honor which he did not refuse, but was loath to accept for fear of hurting the chances of his friend Calhoun. About this time, however, his health began to fail rapidly. On Oct. 21, 1822, he sailed for Europe, but died on the 27th and was buried at sea. His influence in national legislation during the critical decade 1812–22 was very great, and the estimate of him reported to have been made by Henry Clay, that he was the wisest man he ever knew, gives a good idea of his standing among his contemporaries. Consult H. H. R. Ravenel, *Life and Times of William Lowndes* (Boston, 1901).

LOWNDES, William Thomas (c.1798–1843). An English bibliographer. He carried on the trade of a bookseller, in the Strand, London; was an enthusiastic bibliographer and published two books of standard authority in the subjects with which they deal: *The Bibliographer's Manual of English Literature* (4 vols., 1834) and *The British Librarian or Book Collector's Guide* (1839). Only 11 parts of the latter had been completed when the author succumbed to insanity brought on by poverty and neglect. Consult Bohn's edition of the *Bibliographer's Manual* (1864).

LOWRIE, lou′rĭ, Walter (1784–1868). An American legislator and promoter of foreign missions. He was born in Edinburgh, Scotland, but removed with his parents to America in 1791 and settled first in Huntingdon Co. and then in Butler Co., Pa. He educated himself for the ministry, but never filled a pastorate. He was a member of the Pennsylvania Senate from 1811 to 1818 and of the United States Senate from 1818 to 1824, after which he served for 12 years as Secretary of the Senate. During his term as United States Senator he devoted much of his attention to religious matters and was one of the organizers of the congressional prayer meeting and a congressional total-abstinence society. He was elected corresponding secretary of the Western Foreign Missionary Society in 1836 and for more than 30 years held a similar position in the Board of Foreign Missions of the Presbyterian church.—Three of his sons, John Cameron, Walter Macon, and Reuben, were prominent as missionaries to India and China.

LOW SAXON. See Platt Deutsch.

LOW SUNDAY (so called because of its relative importance to Easter). The first Sunday after Easter. This day is also called in the Roman Catholic church *Dominica in Albis Depositis*, because in early times those who had been baptized just before Easter usually wore white garments until this day, and *Pascha Clausum*, because it is the Easter Octave.

LOWTH, or **LOUTH,** louth, Robert (1710–87). An English bishop and scholar. He was born at Winchester, Nov. 27, 1710, the son of William Lowth. He was educated at Winchester School, whence, with a reputation both as a scholar and as a poet, he passed to New College, Oxford, in 1730. There he took his degree of M.A. in 1737 and four years afterward was appointed professor of poetry. In 1750 Bishop Hoadly conferred on him the archdeaconry of Winchester, and in 1753 the rectory of Woodhay in Hampshire. In the same year he published in Latin his *Lectures on Hebrew Poetry* (*De Sacra Poesi Hebræorum Prælectiones Academicæ*). This work had great influence, both in England and on the Continent, and has passed through many editions with notes and emendations (e.g., by Rosenmüller, Leipzig, 1815; Eng. trans., London, 1787; new ed., 1847). It called attention to parallelism as the characteristic of Hebrew poetry and was the beginning of the literary study of Hebrew poetry in modern times. In 1755 Lowth became prebendary of Durham and rector of Sedgefield, Bishop of St. Davids in 1766, of Oxford a few months after, of London in 1777, declined the primacy in 1783 on the score of ill health, and died in London, Nov. 3, 1787. Besides his *Hebrew Poetry*, his two principal works are *Life of William of Wykeham* (1758) and *Isaiah: A New Translation, with a Preliminary Dissertation, and Notes, Critical, Philological, and Explanatory* (1778; 12th ed., 1842). His *Sermons and Other Remains*, with a memoir by P. Hall, appeared in London in 1834.

LOWTH, William (1660–1732). A Church of England divine, father of Bishop Robert Lowth. He was born in London, studied at Oxford in 1679, and was vicar of Buriton, Hampshire, from 1699 to his death. His reputation rests upon his *Vindication of the Divine Authority of the Old and New Testaments* (1692); *Directions for the Profitable Study of Holy Scripture* (1708); and *Commentary on the Prophets* (1714–25), afterward printed as a part of Bishop Patrick's commentary on the Old Testament. Consult his *Life* in the seventh edition of his *Directions for the Profitable Reading of the Holy Scriptures* (London, 1799).

LOWTHER, lou′thẽr, James William (1855–). An English politician. He was educated at Eton, at King's College, London, and at Trinity, Cambridge. He was returned to Parliament as a Conservative for Rutland in 1883 and in 1886 for the Penrith division of Cumberland. In 1891–92 he was Undersecretary of State for Foreign Affairs, from 1895 to 1905 he was Deputy Speaker of the House of Commons and chairman of Ways and Means, and in the latter year he was elected Speaker. He was made Privy Councilor and received honorary degrees from Oxford, Cambridge, and Leeds.

LOWVILLE, lou′vĭl. A village and the county seat of Lewis Co., N. Y., 59 miles north by west of Utica, on the New York Central and Hudson River, and the Lowville and Beaver River railroads (Map: New York, E 3). It is the centre of the hop-growing, agricultural, and dairying interests in the county, and manufactures maple sugar and sirup. Lowville Academy was opened here about 1808, and among other noteworthy features of the village are the county buildings, town hall, and clubhouse. There are municipal water works. Pop., 1900, 2352; 1910, 2940.

LOXA, lō′hȧ. The name of two towns—one in Spain, the other in Ecuador. See Loja.

LOX′ODROME (from Gk. λοξός, *loxos*, oblique + δρόμος, *dromos*, course, from δραμεῖν, *dramein*, to run). A line which cuts the meridians of a sphere under a constant angle. This curve, resembling the logarithmic spiral (see Spiral), was named the *loxodromia sphærica* by Snellius (1624). A ship continuing to sail on a given course, always making the same angle with every meridian, would traverse such a line, called by navigators a rhumb line (*Rumbus*, so called by Pedro Nuñen, 1550). (See Sailings.) Since the introduction of steam navigation the geodetic line has replaced the loxodrome in practical use. The loxodrome in passing around the sphere approaches the pole nearer and nearer, but cannot reach it by a finite number of turns. For theoretical studies of the loxodrome, consult *Nouvelles annales de mathématiques* (1861) and *Journal de mathématiques spéciales* (1885). For historical notes, consult *Bulletin des sciences mathématiques* (1879).

LOY′ALISTS, or Tories. In American history, those persons in the 13 original Colonies who at the time of the Revolutionary War remained loyal to the British government. They represented various classes and seem to have acted upon varying and widely divergent motives. In their ranks were included (1) a large majority of the officeholders and their immediate following; (2) a large majority of those who stood for the moneyed and commercial interests of the Colonies; (3) probably a majority of those who belonged to the learned professions; (4) a majority of those who were conservatives by temperament or training; (5) numerous hangers-on, opportunists, and low politicians, who, believing that the revolting colonists would ultimately be subdued, ostentatiously adhered to the crown in the hope of securing gain and preferment. With regard to the total number of the Loyalists estimates have varied widely, some writers asserting that they constituted a clear majority of the Colonial population, others that they constituted at the best but a small minority. John Adams, at the close of the Revolution, estimated that fully a third of all the people in the Colonies—1,000,000 out of the total population of about 3,000,000—were opposed to the measures of the Revolution in all its stages. In New York, Pennsylvania, Connecticut, North Carolina, and South Carolina, Loyalists were found in greatest numbers. The Patriots, or Whigs, in all the States, being thoroughly organized and aggressive, early got the upper hand and, advancing from social ostracism, boycott, and horseplay, passed rigorous acts against the Loyalists, banishing many, often under penalty of death, deporting many more, attainting others of treason, confiscating the estates of many, and subjecting all who remained within the American lines to a more or less constant surveillance. During the progress of the war many Loyalists fled to England or to some British possession; many took refuge in places, such as New York, held temporarily by the British troops; and a large number enlisted for active duty against their fellow colonists, frequently rendering services of great value to the British commanders. Some Loyalist companies, recruited from the lower and baser elements, committed numerous atrocities and did much to accentuate the hatred felt for the Loyalists as a class by the Whigs. In the treaty of peace closing the war the commissioners of the United States agreed that the Continental Congress should recommend to the various States the rescinding of their anti-Loyalist laws, the permitting of Loyalists to buy back their confiscated estates, and abstention from the passing of new confiscation acts or other acts directed against the lives or property of Loyalists. Congress accordingly made the specified recommendations, which, however, were little heeded by the States; and in the years immediately following the cessation of hostilities thousands of the Loyalists fled from the country. When Sir Guy Carleton (q.v.) evacuated New York, he took with him over 40,000 Loyalists, including his army, to England. There was also during 1783–91 a large migration of Loyalists (known in British North America as United Empire Loyalists) to Canada, New Brunswick, Nova Scotia, Cape Breton Island, and St. Johns (Prince Edward Island). They were the founders of Upper Canada (Ontario) and New Brunswick. Their numbers have been variously estimated from 40,000 to 60,000. About 30,000 went to the Maritime Provinces; by 1791 the remainder had settled in what are now the Eastern Townships, and near Montreal, in the Province of Quebec; or along the northern shores of Lake Ontario, the Bay of Quinte, the Niagara Frontier, and the Grand and Thames rivers. The name Tories, while generally applicable to them during the Revolutionary War, does not accurately suggest their political attitude in the early history of Canada. Many of them became firm supporters of responsible government and political reform. The British government made liberal provision for the Loyalists after the Revolution and paid out a large sum of money to those who had "suffered in their rights, properties, and professions—in consequence of their loyalty to his Majesty and attachment to the British government."

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LOYAL LEGION OF THE UNITED STATES, Military Order of the. A patriotic order, organized April 15, 1865, by officers of the army, navy, and marine corps of the United States who had aided in maintaining the honor, integrity, and supremacy of the national movement, for the purpose of cherishing the memories and associations of the war waged in defense of the unity and indivisibility of the Republic; strengthening the ties of fraternal fellowship and sympathy formed by companionship in arms; for the relief of the widows and children of dead companions of the order, and for the advancement of the general welfare of the soldiers and sailors of the United States. It comprises three classes, the first of which consists of commissioned officers who had served as such in the army, navy, or marine corps of the United States in the suppression of the Rebellion or of enlisted men who had so served and were subsequently commissioned to the regular forces of the United States. Members of the second class are elected from among the eldest male descendants of those eligible for the first class. The third class consists of distinguished civilians who rendered faithful and conspicuous service to the Union during the Civil War. No new elections to this class have taken place since 1890. There were, in 1914, 21 State commanderies, thus distributed in the order of seniority: Pennsylvania, New York, Maine, Massachusetts, California, Wisconsin, Illinois, District of Columbia, Ohio, Michigan, Minnesota, Oregon, Missouri, Nebraska, Kansas, Iowa, Colorado, Indiana, Washington, Vermont, and Maryland. Since 1885 the supreme head of the order has been a commander in chief.

LOYAL TEMPERANCE LEGION. An organization of children, with some 100,000 members in the United States and a few in other countries, started by the Woman's Christian Temperance Union in 1886 to teach children the evil effects of alcohol, tobacco, and other narcotics. There is a course of instruction, and the graduates are organized into State legions, holding annual conventions. See Temperance.

LOY′ALTY ISLANDS. A group of islands in the Pacific, lying east of New Caledonia, in lat. 20° 11′ to 21° 39′ S. and long. 166° 10′ to 168° 10′ E. (Map: Australasia, J 5). It consists of the three larger islands of Lifu, Maré, and Uvea, and a number of small islands, with a total area of about 800 square miles. They are mostly low and poorly watered. The climate is healthful. Bananas are cultivated to some extent, and sandalwood and rubber are exported. The inhabitants, estimated at about 15,000, are of mixed Melanesian and Polynesian descent and are mostly Roman Catholic. The group has belonged to France since 1864 and is an administrative dependency of New Caledonia.

LOYD, Samuel Jones. See Overstone, Baron.

LOYOLA, lȯ-yō′lȧ, Ignatius of. The founder of the Society of Jesus. See Ignatius of Loyola.

LOYOLA, Martín García Oñez de (c.1548–99). A Spanish cavalier, the nephew of the Jesuit founder, Ignatius Loyola, and born in Guipúzcoa. He was a Knight of the Order of Calatrava and was one of the commanders who fought in Peru against the Inca, Tupac Amaru (1572). After the Inca's capture and death Loyola married his niece, Clara Beatriz, and through her got control of some of the Inca's large possessions. He was appointed Governor of Chile in 1592 and from this date until his death was almost constantly occupied with the Araucanian campaign. Despite his lack of men and means he came to the relief of Arauco (1593). He was killed by Indians, with several followers, at Curalava. Consult D. Barros Arana, *Historia jeneral de Chile* (Santiago, 1884–85).

LOYOLA UNIVERSITY. See Saint Ignatius College.

LOYSON, lwä′zôN′, Charles; better known, from his monastic name, as Père Hyacinthe (1827–1912). A famous French preacher. He was born at Orléans, March 10, 1827, and received his early education at Pau, where his father was rector of the academy. He studied four years at the Theological Seminary of St. Sulpice, Paris, and was ordained priest in 1851. After 10 years as professor in the seminaries of Avignon and Nantes and as priest, he entered the convent of the barefooted Carmelites in Lyons and, after two years of novitiate, joined that order in 1863. He preached in several cities of France, attracting attention by his eloquence and enthusiasm. In 1864 he was called to the Madeleine in Paris and in 1865 to Notre Dame. For his boldness in denouncing what seemed to him abuses in the Church he was silenced by the general of his order in July, 1869, and, in consequence, withdrew from the order. His excommunication followed. Late in the same year he paid a brief visit to New York. After the Vatican Council in 1870 he joined the Old Catholic movement in protest against the doctrine of papal infallibility, and was present at the congress in Munich in September, 1871. (See Old Catholics.) In 1872 he was married in London to an American lady. In 1873 he was called to Geneva by certain disaffected Roman Catholics and founded the first Old Catholic church there. Not being in full accord with all members of the party in that city, he returned to Paris the following year. In 1879 he founded in Paris the Gallican church in communion with the Old Catholic and Anglican churches. For a number of years he served this congregation as rector, but ultimately placed it under the charge of the Jansenist church of Holland. (See Jansenism.) Père Hyacinthe gave much of his time to travel. In 1900–01 he visited the East and with his wife was received by several patriarchs of Oriental churches. In 1901 he resumed preaching in Old Catholic and Protestant churches of Switzerland. Père Hyacinthe's writings include: *La société civile dans ses rapports avec le christianisme* (1867); *De la rèforme catholique* (1872–73); *Programme de la réforme catholique* (1879); *Liturgie de l'église catholique-gallicane* (4th ed., 1883); *Mon testament* (1893); *Christianisme et islamisme* (1895). He also edited the periodical *Catholique Français.*

Consult Albert Houtain, "Vie du Père Hyacinthe d'après des documents inédits, 1827–1863," in *Grand Revue*, vols. lxxvii–lxxix, lxxxii (Paris, 1913).

LOZADA, or **LOSADA**, lō-sä'Dȧ, MANUEL (c.1825–73). A notorious Mexican bandit, born near Tepic, of mixed white, Indian, and negro blood. His associations were chiefly with Indians, and he gained much influence among them. He became a cattle thief and bandit and levied tribute on the farmers in the valleys. In the contest between the Liberal and Conservative parties he favored the latter, and during the French intervention he sided with the Imperialists. Maximilian made him a general of division, and Napoleon III conferred upon him the ribbon of the Legion of Honor. During the Empire he exercised unlimited powers in Tepic. He opposed the Juárez government and in 1872 undertook an expedition against Guadalajara, but was defeated. The next year he was captured and executed.

LOZANO, lō-thä'nō, PEDRO (?–c.1759). A Catholic missionary, born in Spain. He entered the Society of Jesus and was sent as missionary to South America, where he became professor in the College of Córdoba at Tucumán. He published six works, of which the most important were *Descripción chorográfica del terreno, ríos, árboles y animales de las dilatadísimas provincias del Gran Chaco Gualamba y de los ritas y costumbres de las innumerables naciones bárbaras é infieles que le habitan* (Córdoba, 1733), which is now very rare, and *Historia de la Compañía de Jesús en la provincia del Paraguay* (2 vols., Madrid, 1754–55). He also furnished Charlevoix with much material for the latter's histories.

LOZEAU, lō'zō', ALBERT (1875–). A Canadian poet. He was born and educated in Montreal. In early life he became an invalid, and the prevailing tone of his poetry is due to an introspective imagination quickened by his enforced retirement. His productions were well received in his native province and were praised in Paris, where his first volume, *L'Ame solitaire* (1907), was published. He also wrote *Billets du soir* (1911) and *Le miroir des jours* (1912). Consult Camille Roy, "French-Canadian Literature," in *Canada and its Provinces*, vol. vi (Toronto, 1914).

LOZ'ENGE (OF. *losenge*, *losange*, *lozenge*, quadrilateral, windowpane, cake of preserves, originally flattery, deceit, from *los*, praise, from Lat. *laus*, praise; the meaning developed from praise to flattery and epitaph, then square gravestone, and finally to square pane, cake, etc.). In heraldry (q.v.), a charge generally enumerated among the subordinaries.

LOZÈRE, lō'zâr'. A southern department of France, formerly part of the Province of Languedoc (Map: France, S., H 4). Area, 1999 square miles. The department is mountainous. In the southeast lie the Cévennes, while north of the river Tarn are the Lozère and Margeride ranges. The highest point is Finiel, 5584 feet. In the mountains the climate is severe and variable, and little grain is produced; but the valley of the Lot and the slopes on the southern side of the Cévennes, looking towards the valley of the Rhone, produce the mulberry, the olive, and the vine. The forests are extensive. Silkworm and bee culture are important industries. Cattle, sheep, and mules are reared and exported in considerable numbers. The principal minerals are silver, lead, and antimony. There are many mineral springs. Capital, Mende. Pop., 1891, 135,517; 1901, 128,866; 1911, 122,738, among whom are many Protestants.

LOZIER, lō'zhẽr, CLEMENCE SOPHIA (HARNED) (1812–88). An American homœopathic physician, born at Plainfield, N. J. After the death of her husband, Abraham W. Lozier, of New York City, she began the study of medicine in the Rochester Eclectic Medical College in 1849 and graduated at the Syracuse Medical College in 1853. She then began to practice in New York City. The lectures she gave in her own house were the beginning of the New York Medical College and Hospital for Women, founded through her efforts in 1863. She was dean of the faculty of the college for more than 20 years. Dr. Lozier was a specialist in the diseases of women and children.

LOZNITZA, lōs'nĭt-sȧ. A town in Servia, on the right bank of the Drina River, 65 miles west by southwest of Belgrade (Map: Balkan Peninsula, B 2). During the European War of 1914 the Austrians succeeded, after heavy shelling, in forcing the passage of the Drina at this point, it thus becoming one of the points at which Servia was invaded. During the later Servian offensive movement, when all the Austrians were driven out of Servia, Loznitza was one of the last places evacuated and was set on fire and partially burned. See WAR IN EUROPE.

LUALABA, lōō'ȧ-lä'bȧ. One of the two main head streams of the Congo. It rises on the southern boundary of Belgian Congo almost exactly midway between the Atlantic and Indian oceans, and flows northward until after a course of 650 miles it unites with the Luapula (Luvua-Luapula) to form the Congo (Map: Congo, E 4). It flows through a mountainous region rich in minerals, where it is obstructed by numerous falls and rapids. It is navigable from Bukama down to its confluence with the Luvua-Luapula.

LUANG-PRABANG, lōō'äng-prä'bȧng. The capital of a protected native state of the same name in Laos, French Indo-China, situated at the confluence of the Nam-kan with the Mekong, about 250 miles west-southwest of Hanoi (Map: French Indo-China, D 3). In the centre of the town rises a hill surrounded by a pagoda. The town has also an extensive royal palace and many temples. A French Administrator assists the King in the affairs of government. The trade is of little importance. Pop., about 40,000.

LUAPULA, lōō'ȧ-pōō'lȧ. One of the main head streams of the Congo, the other being the Lualaba, which joins the Luapula near the parallel of 7° south latitude (Map: Africa, Central, E 5). The Luapula, which is much longer than the Lualaba, may properly be regarded as the Upper Congo. It rises as the Chambesi in the mountains at the south end of Lake Tanganyika, flows into Lake Bangweolo, the southern part of which is, however, hardly more than a swamp, and at times even largely dry, and after a long circuit enters and traverses Lake Moero, southwest of Tanganyika. From Lake Moero to its junction with the Lualaba the stream frequently has the name of Luvua or Luvua-Luapula.

LUBAO, lōō-bä'ō. A town of Luzon, Philippines, in the Province of Pampanga, on the west channel of the Pampanga delta, 5 miles southwest of Bacolor (Map: Luzon, D 7). It is the centre of a rice, sugar, and indigo district. Pop., 1903, 19,063.

LÜBBEN, lụb′ben, HEINRICH AUGUST (1818–84). A German philologist, born at Hooksiel and educated at Jena, Leipzig, and Berlin. He was a teacher at Oldenburg (1844–75) and then became librarian there. He devoted himself to the study of the Low German dialects and in 1875 became editor of the *Jahrbuch des Vereins für nierderdeutsche Sprachforschung.* His works include *Mittelniederdeutsche Grammatik* (1882), *Das Plattdeutsche in seiner jetzigen Stellung zum Hochdeutschen* (1846), and the important *Mittelniederdeutsches Wörterbuch* (1871–81), with Karl Schiller. Consult *Allgemeine deutsche Biographie*, vol. xix (Leipzig, 1884).

LUB′BOCK, SIR JOHN, first BARON AVEBURY (1834–1913). An English naturalist, anthropologist, and publicist. He was born in London, April 30, 1834, the son of Sir John W. Lubbock. He was educated at Eton and entered his father's banking house at 14. He began early in his career to take part in public affairs, and in 1870 was elected to the House of Commons, where he served at intervals until elevated to the peerage as Lord Avebury in 1900. In politics he was of Conservative inclinations and became prominent in measures having to do with education and social reform. He early became actively interested in antiquarian, scientific, and educational affairs. He was vice chairman of the London County Council in 1889–90, and in 1890 succeeded Lord Rosebery as its chairman. He was president of the Entomological Society and of the Anthropological Institute; first president of the Institute of Bankers (1879); president of the British Association (1881) and of the Linnean Society (1881–86); and received honorary degrees from Oxford, Cambridge (where he delivered the Rede lectures in 1886), Edinburgh, Dublin, and Würzburg. He died May 28, 1913.

Although Lord Avebury will be remembered, especially by the citizens of London and Oxford, as a man of affairs and a wise legislator, his fame is far wider and more permanent as a man of science, in which field he achieved eminence, especially in the departments of anthropology and entomology. His *Prehistoric Times, as Illustrated by Ancient Remains and the Manners and Customs of Modern Savages* (1865) formed a textbook on archæology for 20 years or more and has been translated into the chief languages of Europe. In order to interpret the results of explorations in drift gravels, caves, shell heaps, lake dwellings, and earth mounds, Sir John delivered at the Royal Institution of London in 1868 a course of lectures on the mental and social condition of savages, their languages, fine arts, marriages and kinships, laws, moral codes and practices, and religions. These lectures were published in a volume entitled *Origin of Civilization and the Primitive Condition of Man* (1870).

A large share of his labors was devoted to research in several departments of biology, notably in entomology. His first paper on an entomological topic to attract attention was published in the *Transactions* of the Royal Philosophical Society of London for 1857, on "The Ova and Pseudova of Insects." This was followed by various anatomical and embryological papers, the most notable being *Metamorphoses of a May-Fly* (1863–65). In 1873 the Ray Society issued his chief systematic work on insects, *A Monograph of the Collembola and Thysanura.* This work was for a long while the standard authority on the subject of these insects, and there is no doubt that it did much to stimulate investigation of these hitherto neglected creatures. In 1873 he published in *Nature* a series of articles on the "Origin and Metamorphoses of Insects," and these articles were brought together in a volume (1873) which has always had a high place among the workers on the phylogeny of insects. In 1875 he published his charming book *British Wild Flowers Considered in Relation to Insects*, and in 1879 the Linnean Society *Journal* began to publish the results of his experiments on some social insects, which were collected under the title *Ants, Bees, and Wasps* (1882) and became his most popular and best-known work, showing a vast amount of close observation. His deductions have been disputed, notably by the German writer Bethe (see INSECT, *Social Insects*); but his observations form records of great value.

Lord Avebury was also the author of *Fifty Years of Science* (1882); *Flowers, Fruits, and Leaves* (1886); *Senses, Instincts, and Intelligence of Animals* (1888); *Pleasures of Life* (1891); *Use of Life* (1894); *The Scenery of Switzerland and the Causes to which it Is Due* (1896); *The Scenery of England, etc.* (1901); *Essays and Addresses, 1900–03* (1904); *Free Trade* (1904); *Notes on the Life History of the British Flowering Plants* (1905); *Peace and Happiness* (1909); *Marriage, Totemism, and Religion* (1911). Most of these have been widely read and have gone through several editions. Consult H. G. Hutchinson, *Sir John Lubbock, Lord Avebury* (2 vols., New York, 1914).

LUBBOCK, SIR JOHN WILLIAM (1803–65). An English astronomer, the father of John Lubbock, who became Lord Avebury. He was born at Westminster and graduated at Trinity College, Cambridge, in 1825. Devoting himself to astronomical research, he contributed many papers to the *Proceedings* of the Royal Astronomical Society and the Royal Society, of which, respectively, he became member in 1828 and 1829. A medal was awarded him in 1834 by the Royal Society for his investigations on the tides. He gave a uniform method for the calculation of cometary and planetary orbits; proved, in a more general way than Laplace, the stability of the solar system; contributed to the lunar theory and reduced the tabular errors of the moon; and applied the theory of probability to questions connected with life insurance. As third baronet, he succeeded his father in 1840. Besides aiding in the establishment of the *British Almanac*, and contributing to the *Philosophical Transactions*, he published: *An Elementary Treatise on the Computation of Eclipses and Occultations* (1835); *On the Theory of the Moon and the Perturbations of the Planets* (1833–61); *Remarks on the Classification of the Different Branches of Human Knowledge* (1838); *An Elementary Treatise on the Tides* (1839).

LUBEC, lōō′bĕk. A town in Washington Co., Me., four miles south of Eastport, on the line of the Eastern Steamship Corporation (Map: Maine, F 4). Situated on the coast, fishing forms the chief occupation of the town. Smoked fish and sardines are prepared here for shipping. Lubec owns its water works. Pop., 1900, 3005; 1910, 3363.

LÜBECK, lụ′bĕk (*Freie und Hansestadt Lübeck*). One of the constituent states of the German Empire; sometimes, like Hamburg and Bremen, called a city state (Map: Germany, D 2). The state extends, in the lower valley of the Trave, from Holstein northeast to Lübeck Bay, a southwestern arm of the Baltic. On the northwest is the Principality of Lübeck, which belongs to the Grand Duchy of Oldenburg; on the east is the Grand Duchy of Mecklenburg-Schwerin and the Principality of Ratzeburg, which belongs to the Grand Duchy of Mecklenburg-Strelitz. The state consists of the city of Lübeck, the town of Travemünde, and the rural district, including numerous villages; in addition, several exclaves, in Holstein, Mecklenburg-Strelitz, and the Principality of Lübeck. The total area is 297.7 square kilometers (115 square miles). The population of the state has been as follows: in 1816, 36,000; in 1864, 46,000; in 1871, 52,158; in 1880, 63,571 (increase per cent, 21.9); in 1890, 76,485 (18.4); in 1900, 96,775 (23.4); in 1910, 116,599 (18.6). In 1910 the number of Evangelicals was returned as 111,543 (95.7 per cent); Roman Catholics, 3968 (3.4); other Christians, 276; Jews, 623. Of the inhabitants, 109,106 were included in the city of Lübeck and 2162 in the town of Travemünde. The country is mainly a gently rolling plain, abundantly watered and devoted to agriculture. In 1913 there were under rye 3424 hectares, oats 3592, potatoes 1069, wheat 789, barley 223, and hay 2591. About one-seventh of the country is under forest. Water communication is afforded by the Trave River and the Baltic and, with the Elbe, by the Elbe-Trave Canal. Imports by sea in 1911 were valued at 148,200,000 marks, and exports by sea 234,200,000; this trade is practically identical with that of the city of Lübeck. In 1911 there were entered 4025 vessels, of 925,856 tons, and cleared 3708 vessels, of 920,381 tons. The merchant marine at the beginning of 1913 included 59 vessels, of 52,786 tons (steam, 58, of 52,009 tons).

In its administration the State of Lübeck does not differ much from Hamburg (q.v.). Its form of government, which was originally purely aristocratic, gradually assumed a more representative character. The constitution adopted in 1851 was revised in 1875 and amended in 1902, 1905, and 1907. The Senate, at present representing in a way the patrician council which controlled the city during the existence of the Hanseatic League, is composed of 14 members, among whom are included at least eight members of the learned professions (six lawyers) and five merchants. Vacancies in the Senate are filled by members chosen by a commission consisting of an equal number of Senators and members of the House of Burgesses. The Senate, presided over by a burgomaster elected for two years by the Senators from among themselves, is vested with the executive power, and shares the legislative power with the House of Burgesses. Any citizen of 30 years or over, and in full enjoyment of civil rights, is eligible for senatorship. The House of Burgesses consists of 120 members elected by direct vote for six years. One-third of its members are renewed every two years. The functions of the House of Burgesses are purely legislative, and it has the right of initiative in matters relating to public expenditure, foreign relations, and general legislation. The sanction of both Houses is necessary for every new legislative measure. Lübeck is represented by one member in the Bundesrat and one member in the Reichstag. The judges of the lower courts are appointed by the Senate. There is a high court of justice, from which appeals lie to the Hanseatic Court of Appeal at Hamburg, and from this to the Supreme Court of the Empire at Leipzig.

The military affairs of the state are in the hands of Prussia. The budget for 1912 showed estimated revenue and expenditure of 16,444,000 and 16,886,000 marks respectively. The public debt on April 1, 1912, was 62,621,000 marks.

History. Lübeck was founded in 1143 by Count Adolphus II of Holstein, from whom it passed in 1157 to Henry the Lion of Saxony. When the latter lost his territories in 1181, Lübeck became an Imperial city, with extensive privileges. Twenty years later the Danes seized the town, but held it a short time only. Frederick II in 1226 declared Lübeck a free Imperial city, and in 1227 the Danes were defeated in the great battle of Bornköved. Meanwhile the city grew rapidly in population and wealth and enjoyed many special trade privileges. It took a leading part in the foundation of the Hanseatic League and became its head. The constitution of the city became a model for that of other free German towns. With the Reformation internal strife broke out in the city between the aristocratic party, which in the main was Catholic, and the democratic party, whose adherents had embraced the new faith. This soon undermined the prosperity of the city, and the Thirty Years' War inflicted disasters from which it never recovered. Its extensive trade fell chiefly into the hands of the Dutch and the English. During the Napoleonic era it repeatedly changed hands. Its independence was recognized by the Congress of Vienna in 1815. It joined in 1866 the North German Confederation, and became in 1870 one of the states of the new empire.

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LÜBECK. A city of Germany, the capital and only large town of the State of Lübeck (q.v.), 10 miles southwest of the mouth of the navigable Trave and 40 miles by rail northeast of Hamburg (Map: Germany, D 2). The city consists of the inner town, between the Trave and the Wakenitz, and the three suburbs of Sankt Lorenz, Sankt Gertrud, and Sankt Jürgen. The inner town, with its towers, gates, and gabled houses, is still mediæval in appearance. It is especially noted for many fine examples of mediæval brick structures, especially its five principal churches. The church of St. Mary (c.1280–1304) is one of the finest specimens of this kind of architecture. It has three naves (the middle 126 feet high) and two towers 410 feet high. Its interior is profusely decorated with paintings by old German masters, statuary, and wood carving. Among these objects are valuable paintings by Overbeck, Mostaert, and Orley, a fine Gothic ciborium, and some excellent stained glass. Noteworthy is the Briefkapelle, or Chapel of Letters, which owes its name to written or printed prayers formerly sold here, with pictures of the saints. The cathedral, founded by Henry the Lion in 1173 and completed in the fourteenth century, is largely Gothic, although a part of the original Romanesque basilica is retained. It is an attractive edifice with a beautiful vestibule and two towers 394 feet high. Among the numerous objects of fine art which it contains may be mentioned an altarpiece by Memling—a triptych with several scores of figures. The other most noteworthy mediæval churches are those of St. James, St. Peter, and St. Ægidius, while the church of St. Catharine is also worthy of mention. The most prominent of the secular buildings is the Rathaus (1250–1442), a very interesting Gothic brick building with gables and spires. Its northern façade is covered with portraits of German emperors, princes, and local dignitaries. The interior, restored in 1887–91, has a magnificent staircase and a number of imposing chambers with mural paintings and the arms of the Hansa towns. Especially interesting is its war chamber. Other buildings attesting the ancient significance of the town are the house of the Schiffergesellschaft and the Chamber of Commerce.

Lübeck has numerous educational institutions, including the old Katharineum, now a Gymnasium, a realgymnasium in the Minorite cloister, a private Gymnasium, two realschulen, a school of navigation, a seminary for teachers, and a municipal theatre. The municipal library, founded in 1620, contained in 1913, 129,056 volumes (including 900 incunabula) and numerous manuscripts and documents. The museum, built in 1889–92, possesses excellent collections relating to the history of the town, as well as ethnographical, ecclesiastical, and art collections. The most noteworthy of the benevolent institutions is the Hospital of the Holy Ghost, with an Early Gothic chapel of the thirteenth century. Lübeck was never an important industrial city, and its manufacturing industries are still subordinate to its commerce. The chief manufactures are machinery, ironware, ships, chemicals, spirits, preserves, cigars, etc. The extensive commerce is mostly with Denmark, Sweden, and Russia. The harbor has been made accessible to heavy vessels by the canalization of the Trave. The rivalry of Hamburg, which, after the completion of the Kaiser Wilhelm Canal, had threatened the commercial existence of Lübeck, has been somewhat lessened in effect by the Elbe-Trave Canal, which was opened in 1900 between Lübeck and Lauenburg. The chief articles of commerce are timber, grain, coal and coke, iron, wire, and groceries. Pop., 1910, 109,106. See preceding article.

LUBEN′TIA, LU′BENTI′NA. See LIBITINA.

LÜBKE, lụp′k*e*, WILHELM (1826–93). A German art historian, born at Dortmund. He studied at Bonn and Berlin; was professor of architecture at the Berlin Bauakademie (1857–61) and professor of the history of art at Zurich (1861–66), Stuttgart (1866–85), and Karlsruhe (1885–93). He wrote, in a comprehensive and readable style, numerous valuable works, including: *Vorschule zur Geschichte der Kirchenbaukunst des Mittelalters* (1852; 6th ed. under different title, 1873; Eng. trans., *Ecclesiastical Art in Germany during the Middle Ages*, Edinburgh, 1870); *Geschichte der Architektur* (Leipzig, 1855; 6th ed., 1884–86); *Grundriss der Kunstgeschichte* (1860, 13th ed., 1899–1907; Eng. trans. under the title *Outlines of the History of Art* by Clarence Cook, 1878, and reëdited by Russell Sturgis, New York, 1904); *Geschichte der Plastik* (3d ed., 1880; trans. by Bunnet under the title *History of Sculpture*, London, 1878). Lübke was one of the pioneer writers on art history in Germany. His works were for their day both scholarly and appreciative, and correlate the epochs of art history with the great historical periods.

LÜBKE, W. MEYER. See MEYER-LÜBKE, WILHELM.

LUBLIN, lyōō′blĕn. A government of Poland, Russia, bounded by Volhynia on the east and Galicia on the south and southwest (Map: Russia, B 4). Area, 6499 square miles. The general appearance of the region is that of an elevated plateau, bordered and intersected by rivers. Thick forests cover the northern part and marshes and lakes occur in the east. The region is watered by the Vistula, the San, the Wieprz, and the Bug. Agriculture is favored by the abundance of fertile soil as well as by the advantageous position of the government in regard to markets for the disposal of agricultural products. The German colonists and the larger landholders are more or less progressive in their agricultural methods, and even the native peasantry have been making some progress. Stock raising and horse breeding are important industries, and wool is exported; wooden articles form one of the chief products of the house industry. Spirits, beet sugar, flour, leather, trimmed lumber, and bent-wood furniture are the principal manufactures. The trade in grain and lumber is extensive and passes to a large extent through the Vistula. Pop., 1912, 1,575,100, more than half of whom were Roman Catholic Poles, while one-seventh were Jews. Capital, Lublin.

LUBLIN. The capital of the Government of Lublin, Russian Poland, situated on a small tributary of the Wieprz, 100 miles south-southeast of Warsaw (Map: Russia, B 4). It is a town of considerable antiquity, with a Roman Catholic church (St. Nicholas'), dating from 986, a Roman Catholic cathedral of the sixteenth century and a modern Orthodox cathedral, a number of old convents and monasteries, and a fine town hall. Its educational institutions include two Gymnasia, a seminary for priests, and several theatres. It is also the headquarters of the Fourteenth Army Corps. Economically the town is of little importance, and its industrial activity is confined to the production of spirits, leather, agricultural implements, soap, candles, etc. Attached to the jail is a government cloth factory. Pop., 1904, 62,222; 1912, 65,870, about 50 per cent Jews and the rest Poles and Russians. Lublin rose into importance towards the close of the Middle Ages. It was the seat of several important diets, notably that of 1568–69 which decreed the union of Poland and Lithuania into a single commonwealth, which is commemorated by an obelisk erected in 1825. In 1702 the town was taken and plundered by Charles XII of Sweden. Of the old walls only the four gateways remain. Lublin was the scene of a Russian victory over the Austrians in the early part of the war which spread over Europe in 1914. See WAR IN EUROPE.

LUBLINER, lŏŏ-blē′nĕr, HUGO (1846–1911). A German dramatist, whose pseudonym is Hugo Bürger, born in Breslau. His harmless and rather light plays include: *Der Frauenadvokat* (1873), his first great success; *Die Modelle des Sheridan* (1875); *Auf der Brautfahrt* (1880);

Mitbürger (1884); *Die armen Reichen* (1886); *Der riegnitzer Bote* (1891); *Das neue Stück* (1894); *Der schuldige Teil* (1900); *Die lieben Feinde* (1901); *Der blaue Montag* (1902); *Ein kritischer Tag* (1904); *Frau Schubels Tochter* (1905). He also wrote novels of small literary value.

LUBOWSKI, lōō-bôf′skĭ, EDWARD (1839–). A Polish author, best known for his dramas and novels. He was born and educated at Cracow, but after 1865 lived in Warsaw. His first success, *Nietoperze* (1875), a satiric comedy of manners, was followed by the character plays, *Przesady* (1876), *Pogodzeni z losem* (1878), *Sad honorowy* (1880), *Jacuś* (1884), *My sie Kochamy* (1886), *Wycieczka z Przeszkodami* (1893). He wrote also many critical and historical essays. His later work includes the novels *Silni i slabi* (1865, under the pseudonym Spiridion), *Aktorka* (1869), *Na pochyłości* (1874), *Krok daléj* (1885), *Powiastke niemoralne* (1886), *Kochanek Malgosi* (1890).

LU′BRICANTS (from Lat. *lubricare*, to make smooth, from *lubricus*, slippery). Substances applied to the bearing, guiding, or contact surfaces of machinery to reduce the resistance of friction to motion. Lubrication is the process of applying lubricants. Lubricants may be either solid, semisolid, semifluid, or liquid. The requisites of a good lubricant are: (1) body enough to prevent the surfaces to which it is applied coming in contact with each other; (2) freedom from corrosive acid of either mineral or organic acid origin; (3) as great fluidity as possible consistent with body; (4) a minimum coefficient of friction or tensional resistance of the particles to motion; (5) high flash and burning points; and (6) freedom from all materials liable to produce oxidization or result in gumming. Engineers have suitable tests for determining all of these properties of lubricants. The late Prof. R. H. Thurston stated the best lubricants for different purposes to be: for low temperatures, such as rock drills driven by compressed air, light mineral lubricating oils; for very great pressures, with slow speed, graphite, soapstone, and other solid lubricants; for heavy pressures, with slow speed, solid lubricants and lard, tallow, and other greases; for heavy pressures and high speed, sperm oil, castor oil, and heavy mineral oils; for light pressures and high speed, sperm, refined petroleum, olive, rape, and cottonseed oils; for ordinary machinery, lard oil, tallow oil, heavy mineral oils, and the heavier vegetable oils; for steam cylinders, heavy mineral oils, lard, and tallow; for watches and other delicate mechanism, clarified sperm, neats-foot, porpoise oil, olive oil, and light mineral lubricating oils; for mixture with mineral oils, sperm is best, lard oil is much used, olive oil and cottonseed oil are good. The preceding list gives a reasonably comprehensive résumé of the ordinary lubricants; special lubricating compositions sold under various trade names are combinations of these lubricants. Lubrication may be performed by manual application of the lubricant, or mechanical devices may be used for this purpose. These mechanical devices are called lubricators and they are made in a variety of forms and often are rather elaborate in character. In all cases they consist essentially of a reservoir for the lubricant from which one or a number of pipes lead to suitable discharge points at the different bearings or contact surfaces and of mechanical or other means to deliver or force the oil through the pipes, together with controlling devices to regulate quantity delivered. Most modern lubrication is done by forcing the oil by pumps so as to deliver the lubricant under pressure to and over the surfaces to be lubricated. Splash lubrication is the system possible when an element such as a crank or connecting rod can be made to dip into a bath of oil at each revolution within a closed chamber, and the oil is so agitated by the splash as to be projected to all parts of the chamber and copiously coat all surfaces on which the oil is thus thrown. Steam cylinders are lubricated by balancing the steam pressure by some equal or greater pressure by a pump or by a head of water or oil. Consult: Kent, *Mechanical Engineers' Pocket Book* (8th ed., New York, 1913); Thurston, *Treatise on Friction and Lost Work in Machinery and Mill Work* (ib., 1894); Hurst, *Lubricating Oils, Fats, and Greases* (London, 1896). See OILS.

LUCA. See LUCCA.

LUCA GIORDANO, lōō′kȧ jôr-dä′nō. See GIORDANO.

LUCAN (M. ANNÆUS LUCANUS) (39–65 A.D.). The chief Roman poet of the Silver Age. He was born at Corduba (the modern Cordova), in Spain, 39 A.D., and brought to Rome in his infancy by his father, who was a younger brother of the philosopher Seneca. He received an education of the best kind, was a schoolfellow of Persius, the satirist, and a friend of the Emperor Nero, and entered on life with the most brilliant prospects. He became quæstor and augur and declaimed and recited in public with the highest applause. But he soon lost the favor of Nero, who was jealous of his poetry and his fame. Under the sting of this annoyance, he joined the conspiracy of Piso against Nero's life in 65 A.D. According to Tacitus, when arrested after the betrayal of the plot, he tried to save his life by accusing his mother of complicity. But the Emperor did not spare him for the sake of this additional crime; he was compelled to destroy himself by having his veins opened, and he died in this way, with a certain ambitious composure, at 26 years of age. Lucan holds a conspicuous place among the poets of Rome. The only work of his that has come down to us is the *Pharsalia*, an epic, in 10 books, on the civil war between Cæsar and Pompey. As an epic, it is in parts disappointing, for it proceeds in the manner of annals, and lacks the comprehensiveness, unity, and learning of the greatest works of its class. Nor is its style, generally speaking, good, for it is often turgid and obscure. But when every deduction has been made, the *Pharsalia* affords ample proof that Lucan was a man of real and powerful genius. There is everywhere evidence that Lucan had an eye for the sublime, both in the moral and in the physical world; there is all the vigor of poetic oratory in its declamations; and there are felicities of epigram which have secured to many a line a constant freshness of life as part of the familiarly remembered literature of the world. Lucan was very popular in the Middle Ages, and in modern times his poem has been a particular favorite among the lovers of political freedom.

The first book of the *Pharsalia* was translated into English verse by Christopher Marlowe in 1593; and the whole poem was set in English verse by Rowe (London, 1718, with several later editions)—a translation which Dr. Johnson thought one of the best in the language. There is a fine English prose translation by Ridley (London, 1905). The best editions of the *Pharsalia* are those of Haskins, with introduction and notes (London, 1887: the introduction, containing an elaborate discussion of Lucan's life, of the *Pharsalia*, its contents, its merits, and its weaknesses, is by Heitland), Francken, with notes (2 vols., Leyden, 1896–97), and, of the text only, Hosius (Leipzig, 1892, 1905). Book i was edited by Lejay (Paris, 1894), book vii by Postgate (Cambridge, 1896, 1913). Consult: H. E. Butler, *Post-Augustan Poetry* (Oxford, 1909), and Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part ii (3d ed., Munich, 1913).

LUCAN, lū'kan, EARL OF. See SARSFIELD, PATRICK.

LUCAN, GEORGE CHARLES BINGHAM, EARL OF (1800–88). An English soldier. After passing through Westminster School he entered the army and took part as a volunteer with the Russian forces in the Turkish campaign of 1828. He was elected a representative peer for Ireland in 1840 and served through the Crimean War as commander of a division of cavalry. He won for himself the rather unenviable distinction of being chiefly responsible for the blundering order that sent the Six Hundred upon their glorious but hopeless charge. He was made lieutenant general in 1858, general in 1865, and field marshal in 1887.

LUCA'NIA. In ancient geography, a district of southern Italy, or Magna Græcia, extending from the Tyrrhenian Sea on the west to the Gulf of Tarentum on the east; bounded on the south by the Bruttii, on the north by Apulia and Samnium, and on the northwest by Campania. With the exception of an extensive plain between the Apennines and the Gulf of Tarentum, the region is mountainous. It was one of the wildest parts of Italy and sent from its mountain forests wild boars for the amphitheatres of Rome. There were numerous Greek colonies along the coasts. The principal cities were Sybaris, Heraclea, Metapontum, and Thurii on the east coast; Pæstum (earlier Posidonia) and Elea or Velia on the coast of the Tyrrhenian Sea; Pandosia and Potentia in the interior. The original inhabitants of Lucania were the Chones and the Œnotrians, who were gradually subdued by the Lucani, a Samnite tribe from the north, in the fifth century B.C. In 280 B.C. Lucania joined Pyrrhus (q.v.) against Rome, but was subjected by the Romans by 272. Later, the Lucanians aided Hannibal against Rome. In the Social War (q.v.) they fought against Rome. Thenceforth the district had little importance.

LUCANUS, OCELLUS. See OCELLUS LUCANUS.

LUCA'RIS, CYRIL (c.1572–1637). A Greek theologian. He was born in Crete, probably in 1572, studied first at Venice and afterward at Padua and subsequently visited Switzerland, where he formed intimate relations with the Protestant doctors and carried back into Greece their spirit and their dogmas. Ordained a priest, he became Patriarch of Alexandria in 1602 and in 1621 Patriarch of Constantinople. He still cherished his Protestant opinions and endeavored to promulgate them in the church over which he ruled; but violent opposition arose among the clergy, and Lucaris was banished to Rhodes. Through the influence of the English Ambassador, however, he was soon reinstated. A confession of faith he had printed at Geneva in 1629, quite Protestant in its character, fell into the hands of his adversaries, and he was once more involved in difficulties. In 1636 he was banished to the isle of Tenedos, and, though recalled after a few months, in June, 1638, he was seized in Constantinople, hurried on board a vessel, and it was never positively ascertained what became of him. According to some, he was strangled in the ship which bore him off; according to others, he suffered this fate in a castle on the shores of the Black Sea. His doctrines have been repeatedly condemned by Greek synods. The *Codex Alexandrinus* was presented by him to Charles I of England. Consult his *Life* by Pichler (Munich, 1862). See GREEK CHURCH; JERUSALEM, COUNCIL OF.

LU'CAS, ALBERT PIKE (?–). An American landscape, figure, and portrait painter; also a sculptor. He was born in Jersey City and studied at the Ecole des Beaux-Arts (1882–88) in Paris under Hébert and Boulanger and later under Courtois and Dagnan-Bouveret. At the Salon of 1896 he won a medal. After a sojourn in Italy he settled in New York in 1902. His painting is distinctly personal, with the lyric note predominant, and shows sympathetic intimacy with nature, especially in her larger and more mysterious aspects. His handling is broad yet conscientious, his color scheme rich and glowing, and he excels in the management of diffused light, as is seen most strikingly in his well-known "Golden Madonna." He paints by preference nocturnes and twilight scenes, such as "October Breezes" (National Gallery, Washington), "The Little Church on the Hill," and "Walking against the Wind." He also painted portraits of many prominent persons. A good specimen of his work as a sculptor is the statuette "Ecstasy," in the Metropolitan Museum, New York.

LUCAS, lụ'kȧ', EDOUARD (1842–91). A French mathematician, born at Amiens. He was educated at the Ecole Polytechnique and the Ecole Normale Supérieure in Paris. Upon leaving the latter he was made adjunct astronomer at the national observatory. He then became professor of mathematics at the lycées Charlemagne and Saint-Louis. His mathematical work was confined almost entirely to the theory of numbers, along the line followed by Fermat, although he also contributed somewhat to the theory of conics and to modern geometry. Besides a large number of memoirs in the *Nouvelles Annales*, *Comptes Rendus*, and other journals, he published the following works: *Application de l'arithmétique à la construction de l'armure des satins réguliers* (1867); *Recherches sur l'analyse indéterminée et l'arithmétiques de Diophante* (1873); *Récreations mathématiques* (1881–94); *Théorie des nombres* (1891). He was also coeditor with Henry of the *Œuvres complétes de Férmat.*

LU'CAS, EDWARD VERRALL (1868–). An English essayist, biographer, and writer on travel. He was born at Brighton, was educated privately and at University College, London, and early joined the staff of the Sussex *Daily News.* From 1893 to 1900 he was with the *Globe* (London), from 1896 to 1901 with the *Academy*, and subsequently with *Punch.* His literary activities were varied. He wrote books for children; was a most discriminating and delightful anthologist; excelled as an essayist of quietly humorous type (Lamb being his chosen master); was a biographer of distinction, an accomplished editor, and a highly interesting chronicler of his rambles at home and travels abroad. The following list of his publications, although incomplete, is representative of his range: *The Open Road* (1899), a compilation for wayfarers; *Highways and Byways in Sussex* (1904); *A Wanderer in Holland* (1905); *Friendly Town: A Little Book for the Urbane* (1905); *Life of Charles Lamb* (2 vols., 1905); *A Wanderer in London* (1906); *Listener's Lure* (1906); *Character and Comedy* (1907), essays; *The Gentlest Art: A Choice of Letters by Entertaining Hands* (1907); *Over Bemerton's* (1908); *Anne's Terrible Good Nature, and Other Stories for Children* (1908); *A Wanderer in Paris* (1909); *Mr. Ingleside* (1910); *The Slow Coach* (1910); *Old Lamps for New* (1911); *London Lavender* (1912); *A Little of Everything* (1912); *Loiterer's Harvest* (1913), essays; *Harvest Home* (1913); *Landmarks* (1914); *A Wanderer in Venice* (1914). Lucas edited the *Works of Charles and Mary Lamb* (7 vols., London, 1903–05; 6 vols., New York, 1913).

LUCAS, Frederic Augustus (1852–). An American museum director, born at Plymouth, Mass. He was an assistant in Ward's Natural Science Establishment at Rochester, N. Y., in 1871–82; then served as osteologist (1882–87), assistant curator of the division of comparative anatomy (1887–93), and curator (1893–1904), of the United States National Museum; and from 1904 to 1911 he was curator in chief of the museum of the Brooklyn Institute of Arts and Sciences. In 1911 he was appointed director of the American Museum of Natural History, New York City. At one time he served on a national fur-seal commission making investigations in the Pribilof Islands. He wrote many papers on the anatomy of birds, on fossil vertebrates, and on museum methods; published treatises on *Animals of the Past* (1901) and *Animals before Man in North America* (1902); and contributed to the New International Encyclopædia.

LUCAS, John Seymour (1849–). An English historical painter. He was born in London and studied at the schools of the Royal Academy. He became a Royal Academician in 1898. Lucas's historical paintings show accurate knowledge of the costume and customs of the epoch portrayed and technical skill, and in spite of their sentimentality possess some artistic qualities. Among the best are "Armada in Sight" (1880, National Gallery, Sydney); "Spy in Camp" (1882); "Whip for Van Tromp" (1883); "After Culloden" (1884, Tate Gallery, London); "Peter the Great at Deptford" (1886); "The Keeper of the King's Conscience" (1900); "The Nimble Gaillard" (1901); "Silenced" (1908). In 1898 he painted the fresco for the Royal Exchange representing "William the Conqueror Granting the First Charter to the City of London," and in 1902 was commissioned by King Edward to paint the reception of the Moorish Ambassador. Consult the monograph by Fea, *Christmas Art Journal* (London, 1908).

LUCAS, Vrain. See Chasles, Michel.

LUCAS DE BORGO, lo͞o′kȧs dā bôr′gō. See Paccioli.

LUCA SPINELLO. See Spinello Aretino.

LUCAS VAN LEYDEN, vȧn lī′den (c.1494–1533). The principal sixteenth-century Dutch painter, line engraver, and designer for woodcuts. He was born at Leyden, the son of Huig Jacobsz, an engraver, from whom he received his first instruction. He also studied under Cornelis Engelbrechtsen and at an early age was a celebrated engraver. His precocity was such that, according to Van Mander, he began to engrave at nine years and painted "The History of St. Hubert" in water colors at 12. In any case, his large plate "Mahomet" dates from 1508, and two years later he engraved one of his most important copperplates, the "Ecce Homo." He early married a rich wife, of the Borchiuzen family in his native town. In 1521 he visited Antwerp, where he met Albrecht Dürer, who drew his portrait in silver point (Lille Museum) and exchanged prints with him. He had already been influenced by Dürer, and a friendly rivalry existed between them. In 1522 he was elected a member of the Guild of St. Luke, and in 1527 he traveled luxuriously through Belgium in company with Jan Mabuse. He died, after a long illness, in 1533.

His art is characterized by earnest realism, energy of expression, and extreme care in drawing, the details and accessories being finished with great precision; in painting his color is luminous, but sometimes presents gaudy contrasts; his flesh tints are warm in tone. His personages are honest and homely, with gestures frankly expressed; even his religious subjects are genre in character. His last works show Italian influence. As an engraver, he stands preëminent for the skill shown in grouping figures and in expressing aërial perspective. After 1527 his plates, owing to the influence of Mabuse and the Italian school, lose the rich color which formerly distinguished them and become purely linear, the action becomes more violent, and the figures, hitherto of great variety of type and costume, are usually presented nude. His paintings are few in number, the best paintings being the following: "Healing of the Blind Man" (Hermitage, St. Petersburg); "Last Judgment" (Town Hall, Leyden); a "Card Party" (Wilton House, England); "Virgin with Saints" (Munich Gallery); portrait of himself (Brunswick Museum); "Salome" (Johnson collection, Philadelphia). An unfinished painting in tempera and "Joseph's Coat" in the Metropolitan Museum are attributed to him. His best plates include: "Conversion of St. Paul" (1509); "Ecce Homo" (1510); "Crucifixion" (1517); "Magdalen Dancing," also called "The Garden of Love" (1519); "Esther and Ahasuerus"; "Return of the Prodigal Son"; "Abraham Dismissing Hagar." A complete catalogue of his engraved work, which comprises 177 copperplates, 32 woodcuts, and 8 etchings, was published by Volbehr (Hamburg, 1888). Consult: Evrard, *Lucas de Leyde et Albert Durer* (Brussels, 1883), a romance; Franz Dülberg, "Das jüngste Gericht des Lucas van Leyden," in *Repertorium für Kunstwissenschaft*, vol. xxii (Berlin, 1899); Nicolaas Beets, *Lucas de Leyde* (Brussels, 1913).

LUCAY, lụ′kā′, Charles Hélion Marie, Count de (1831–1905). A French historian, born in Paris. In 1855 he was auditor of the Council of State, then Master of Requests under the Empire (1866), but retired to devote himself to history and agriculture. He was a member of the committee for historical works from 1875 and in 1891 was elected corresponding member for the Academy of Moral and Political Science. He published: *Les assemblées provinciales sous Louis XVI et les divisions administratives de 1789* (1857); *Les contributions de la*

France à cent ans de distance 1789–1889 (1891); *La décentralisation* (1895); also numerous treatises dealing mainly with the County of Clermont.

LUCAYA, lo͞o-kä′yȧ. See Abaco.

LUCBÁN, lo͞ok-bän′. A town of Luzon, Philippines, in the Province of Tayabas. It is situated in the heart of the mountain region in the western part of the province, 8 miles northwest of Tayabas (Map: Luzon, H 10). The chief industry is the manufacture of straw hats and mats, and the town carries on a profitable trade with the neighboring provinces. Much rice is grown on the terraces of the near-by hills. Pop., 1903, 10,227.

LUCCA, lụk′kȧ. A famous and charming city of Italy, capital of the Province of Lucca, Tuscany, 13 miles by rail northeast of Pisa (Map: Italy, C 3). It is a mediæval, multicolored town, situated in a productive plain. It is surrounded by fortifications built between 1504 and 1645; they are in a good state of preservation. The streets are narrow and crooked. The city is somewhat important in the history of mediæval architecture as seen in its churches; and the sculptures of its citizen Civitali (q.v.) draw many connoisseurs. The celebrated Romanesque cathedral of San Martino, erected in the latter part of the eleventh century, has been often restored and in the Gothic style. Its rich façade dates from 1204 and together with the highly ornamented vestibule is one of the chief attractions. Some of the reliefs are by Niccolò Pisano. The interior (91 yards in length) is also notable, with paintings by Ghirlandaio and a beautiful Madonna by Fra Bartolommeo. It also contains a rare pulpit, a small marble chapel (il Tempietto) with sacred contents, shown thrice a year, and the Pisan Cross, in silver, captured from the Pisans. Another fine church is the Basilica San Frediano, dating from early mediæval times and possessing over 20 antique columns. It was restored in 1827. The façade is of the twelfth century. Among the contents are noteworthy paintings by Francesco Francia and Jacopo della Quercia.

The Palazzo Provinciale, formerly the ducal residence, was begun in 1578 after plans by Ammanati and never finished. It is situated on the Piazza Napoleone and possesses a good picture gallery, with worthy examples of Giulio Romano and Fra Bartolommeo. There are several palaces of mediæval noble families. The city market (Piazza del Mercato) stands on the interesting remains of a large Roman amphitheatre. Lucca has two academies of science, literature, and art, one of them founded at the close of the seventeenth century. Its four libraries possess rare manuscripts and editions. The public library in 1913 contained 217,688 volumes. Among the public monuments are a statue of Garibaldi and a bust of Mazzini. Owing to the thrift and industry of its inhabitants, the city has long been called Lucca l' industriosa. It is especially known for its silk manufactures, but these are of far less importance than formerly. Velvets and other textiles are also produced, and there are foundries and glass and paper factories. A few miles north of the city is carried on a large manufacture of jute goods. The town has an active trade. Lucca is the seat of an archbishop. The environs are very attractive and abound in villas, the most prominent of which is the royal Villa di Marlia. To the south is a majestic aqueduct with some 450 arches. To the northeast is famous Bagni di Lucca (q.v.). Pop. (commune), 1901, 74,971; 1911 (census of June 10), 76,160.

History. Lucca first appears in history as an Etruscan town (Luca), which was taken 177 B.C. by the Romans and made a colony. After the fall of Rome it passed into the hands successively of the Ostrogoths, Lombards, and Franks. Before the rise of Florence it was the principal city in Tuscany. Weakened by the long feuds between the Ghibellines and the Guelphs within the city, Lucca came in 1314 into the possession of Uguccione della Faggiuola, the ruler of Pisa. In 1327 the celebrated Castruccio Castracani became Duke of Lucca. Subsequently the city changed hands repeatedly, but in 1370 it regained its independence. For more than two centuries its government was democratic, but ultimately the power passed into the hands of an oligarchy. In 1799 it was taken by the French and in 1805 was bestowed by Napoleon on his sister Eliza, Princess Bacciochi. By the Congress of Vienna it was given to the Spanish infanta, María Louisa, the former Queen of Etruria, and her son, Charles Louis. In 1847 the duchy was united to Tuscany, thus becoming in 1860 a part of united Italy. Consult: *Memorie e documenti per servire all' istoria dello stato e città di Lucca* (14 vols., Lucca, 1813–60); Del Carlo, *Storia popolare di Lucca* (2 vols., ib., 1877); Ross and Erichsen, *Story of Lucca*, in "Mediæval Towns Series" (London, 1912).

LUCCA, Duke of. See Castruccio Castracani.

LUCCA, lụk′kȧ, Pauline (1841–1908). A German dramatic soprano, born in Vienna. She was a pupil of Uschmann and Lewy, but was too poor to continue her studies and so joined the chorus of the Vienna Court Opera. In 1859 she made her début at Olmütz as Elvira in *Ernani*. She then sang for a while in Prague and in 1861, having attracted the attention of Meyerbeer, obtained an engagement at Berlin, where her success was absolute for years. In 1863 she made her first appearance in England, which country, as well as France and Russia, she subsequently visited often. In 1872 she came to the United States, where she became a great favorite. Meyerbeer and Auber considered her unequaled, and the latter was so struck by her interpretation of the part of Zerlina in *Fra Diavolo* that he gave her the pen with which he had written the opera. From 1874 to 1889 she was a member of the Vienna Opera.

LUCCHESINI, lụk′kȧ-zē̆′nė, Girolamo, Marchese (1751–1825). A Prussian diplomat, born at Lucca. In 1779 he went to Berlin, was introduced by Abbé Fontana to Frederick II of Prussia, and was made his librarian. In 1790 he was sent to Warsaw, where in spite of strong opposition he concluded a treaty between Poland and Prussia, and in 1802 he was sent to Paris as plenipotentiary and advocated a Franco-Prussian alliance. In 1806, on the outbreak of war, he left Paris, and was a peace commissioner after the battle of Jena, but, the King not approving the terms he had made, he retired to Lucca in 1807. His *Opera* appeared in 22 volumes (1832–34).

LUC′COCK, Naphtali (1853–1916). An American Methodist Episcopal bishop, born at Kimbolton, Ohio. He graduated from Ohio Wesleyan University in 1874 and received the degree of Ph.D. from the Western University of Pennsylvania (now the University of Pittsburgh) in 1886. He entered the ministry of his denomination, joining the Pittsburgh conference in 1874. Later he was transferred to the St. Louis conference. From 1885 to 1888 he was professor in Allegheny College. He was one of the founders and editors of the *American Illustrated Methodist Magazine* of St. Louis. In 1912, elected Bishop, his residence was assigned at Helena, Mont. He is the author of *The Illustrated History of Methodism* (1901), with J. W. Lee and J. M. Dixon, and *The Royalty of Jesus* (1905), sermons.

LUCE, lụs, AUGUSTE SIMÉON (1833–92). A French historian, born at Bretteville-sur-Ay, Manche, and educated at the Ecole des Chartes (1856–58), where he studied law. He was made archivist of the Department of Deux-Sèvres (1858), and was head of the historical department in the national archives from 1866. In 1882 he was made a member of the Academy of Inscriptions and Belles-Lettres, professor of the sources of French history at the Ecole des Chartes the same year, and in 1883 received the Legion of Honor cross. He prepared an edition of Froissart's Chronicles (1866–88), one of the *Chronique du Mont-Saint-Michel* (1879–86), and published also *De Gaidone Poemate Gallico Vetustiore Disquisitio Critica* (1860); *Chronique des quatre premiers Valois* (1862); *Histoire de Bertrand Duguesclin et de son époque* (1876, 2d ed., 1883); *Jeanne d' Arc à Domrémy* (1886); *La France pendant la guerre de Cent Ans* (1890).

LUCE, lūs, STEPHEN BLEECKER (1827–1917). An American naval officer, born in Albany, N. Y. He entered the navy in 1841, was commissioned lieutenant in 1855, and in 1862 as lieutenant commander aided in the blockade of South Carolina ports, participating in the battles of Hatteras Inlet and Port Royal. In 1872 he became captain, in 1881 commodore, and in 1885 rear admiral. From 1884 to 1886 he was president of the Naval War College, of which he was a founder, and in 1889 he was retired. In 1892 he represented the United States as Commissioner General at the Columbian celebration held at Madrid to commemorate the four-hundredth anniversary of the discovery of America. He published *Seamanship* (new ed., 1905), which was used as a textbook at the Naval Academy, and edited *The Patriotic and Naval Songster* (1883).

LUCENA, lōō-thā'nȧ. A city in the Province of Cordova, Spain, 40 miles southeast of the city of that name, and picturesquely situated between two hills (Map: Spain, C 4). The neighboring territory is famous for its breed of horses and its production of wine; the city has manufactures of textiles, bronze, and earthenware. Pop., 1900, 21,294; 1910, 21,029.

LUCERA, lōō-chā'rȧ (Lat. *Luceria*). An episcopal town of south Italy, in the Province of Foggia, on an eminence 10 miles west-northwest of Foggia (Map: Italy, E 4). It has a lyceum, a technical school, a fourteenth-century cathedral, a splendid episcopal palace, and well-preserved remains of a castle built by Emperor Frederick II. It manufactures pottery and has a good trade in silk. Pop. (commune), 1901, 17,515; 1911, 16,922. Numerous inscriptions and fragments of ancient sculpture have been found there.

LUCERA, DUKE OF. See GALLAS, M.

LU'CERES. One of the three patrician tribes of ancient Rome.

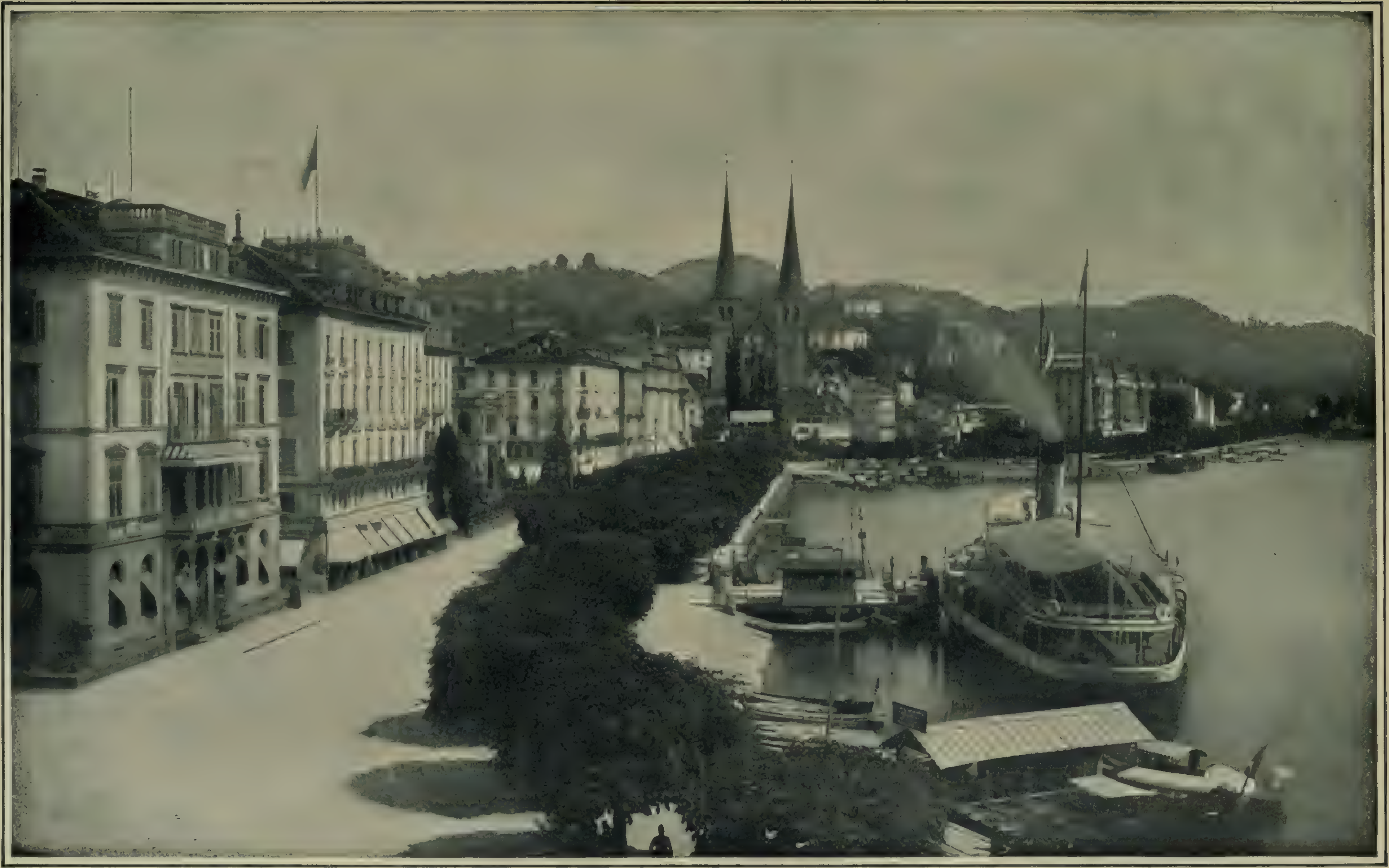
LUCERNE, lū-sẽrn'. A leguminous fodder plant. See ALFALFA.

LUCERNE, lōō-sẽrn', *Fr. pron.* lụ'sârn'. A canton of north central Switzerland, bounded by the Canton of Aargau on the north, Zug, Schwyz, Unterwalden, the Lake of Lucerne on the east, and Bern on the south and west (Map: Switzerland, C 1). Area, 579 square miles. The southern part belongs to the great Alpine highland, two spurs of which, the Emmenthal Alps, inclose the Entlebuch valley, through which the Little Emme flows into the Reuss after the latter issues from the Lake of Lucerne (q.v.). Northward the land slopes into the Gäu valley, watered by the Wigger, the Suhr, the Wynen, and other tributaries of the Aar. Here also are the two lakes of Baldegg and Sempach. The great northern valley is essentially an agricultural country, and about four-fifths of the whole canton consists of arable or pasture land. Corn, oats, potatoes, flax, hemp, and fruit are produced; it is one of the foremost stock-raising cantons, especially for cows and goats. Large quantities of milk are yielded, of which about 60 per cent is used in the manufacture of cheese and condensed milk. Wine is produced. Straw braiding is carried on largely as a house industry, and there are some textile, metal, paper, and tobacco manufactures, especially in the neighborhood of the city of Lucerne. Much of the power for its manufacture is developed by waterfalls. By the cantonal constitution of 1875, but slightly revised since, there is a Legislature of 55 members elected by the people for four years, and an executive of seven members elected by the Legislature for the same period. The initiative and referendum are in force, and a popular vote can be called by the demand of 5000 citizens. The canton sends eight members to the National Council. It is divided into five administrative districts and 55 communes, which exercise local self-government. Education is well provided for in primary and secondary schools. Pop., 1900, 144,337; 1910, 166,782, practically all German-speaking Roman Catholics.

The history of the canton is largely bound up with that of the city of Lucerne (q.v.). It was the fourth to join the Swiss Confederation, which it did in 1332. During the fourteenth and fifteenth centuries it increased its territory by purchase and by conquest. Its government was largely an oligarchy in the hands of a few families until the French invasion of 1798, when democratic institutions were established. The chief towns besides Lucerne are Kriens, Willisau, Ruswil, Littau, and Ommen.

LUCERNE, lōō-sẽrn', *Fr. pron.* lụ'sârn'. The capital of the Canton of Lucerne, Switzerland, situated on the Reuss, where it issues from the northwest extremity of the Lake of Lucerne 59 miles southeast of Basel (Map: Switzerland, C 1). Its location in an amphitheatre of mountains, including the Rigi and Pilatus, and its walls with nine mediæval watchtowers, make it one of the most picturesque towns in Switzerland. It has a mild climate. The city is divided by the river into two parts, connected by six bridges, of which two are covered, mediæval structures painted with scenes from the lives of St. Leodegar and St. Mauritius, the patron saints of Lucerne, and with a "Dance of Death." The Quai National and the Schweizerhof Quay run along the north shore of the lake, where the new town lies. The older portion of the city extends along the south bank of the river and is built after the mediæval fashion, with crooked, narrow thoroughfares and old-fashioned houses.

LUCERNE



THE SCHWEIZERHOF QUAY AND HOFKIRCHE

Of the churches the finest is the Hofkirche, said to have been founded in the eighth century, with two slender towers erected in 1506. It has much fine wood carving, glass windows, a treasury of twelfth-century works of art, frescoes by Deschwanden, and an organ famous for the purity of its tones. The town hall dates from the seventeenth century and contains an antiquarian and an art collection. Its stained glass is noteworthy. The most noted memorial the town possesses is the famous "Dying Lion of Lucerne," carved out of the side of a grotto from a model by Thorwaldsen, to commemorate the defense of the Tuileries in Paris, Aug. 10, 1792, by the Swiss Guards, who were massacred by the infuriated mob. The lion is 28 feet in length. The adjacent Glacier Garden is unique, and near by is the Museum of War and Peace, dedicated to international peace in 1902 and completed in 1910. It has a hall of arms and maps of battles down through the Russo-Japanese War. Among the educational institutions are the cantonal school, equipped with extensive geological and botanical collections, and various secondary, technical, industrial, and commercial schools. There are also a musical conservatory; the museum containing the cantonal library (95,000 volumes); the municipal library, rich in books of Helvetian history; the cantonal natural-history collection; the museum of stuffed Alpine animals; and the panoramas of Lucerne history and scenery.

Lucerne derives its water supply through an aqueduct from the springs of Mount Pilatus, 14 miles away; it also owns its electric and gas works. It has but little trade and manufactures only small quantities of silk and ironware. The chief business of the inhabitants is the accommodation of the 140,000 tourists who yearly throng to its 67 hotels. The environs are famous for their beauty and historic interest. (See Lucerne, Lake of.) Pop., 1900 (commune), 29,600; 1910, 41,500, mostly Roman Catholic.

Lucerne appears as a town as early as the eleventh century. It was purchased by the house of Hapsburg in 1291 and in 1332 entered the Swiss Federation, its citizens taking part in the battle of Sempach in 1386. The Reformation was not well received in Lucerne, and the city led the Catholic forces during the religious wars. In 1798 it became the capital of the Helvetic Republic. In 1844 it was the head of the Sonderbund, but capitulated in 1847 and was occupied by the federal troops. Consult J. C. Heer, *Guide to Lucerne* (Lucerne, 1899), and Murray, *Handbook for Switzerland* (19th ed., London, 1904).

LUCERNE, Lake of (Ger. *Vierwaldstätter See*, lake of the four forest cantons). A beautiful lake of Switzerland and one of the most famous lakes in Europe. It is situated in the north-central part of the country, bordering on the cantons of Schwyz, Uri, Unterwalden, and Lucerne (Map: Switzerland, C 1). It has roughly the shape of a cross with irregular and winding arms. The altitude is 1435 feet; the greatest depth, 700 feet. The length of the main body, from the town of Lucerne in the northwest to Flüelen in the southeast, is 23 miles. The average width is 1½ to 2 miles, but in several places it is reduced to a half of a mile or less by outjutting promontories which divide the lake into several basins. Of these basins the principal are the Bay of Lucerne, forming the upper end of the cross, those of Alpnach and Küssnacht, forming the two cross arms, and the Weiggiser See, the Buochser See, and the Lake of Uri, forming the divisions of the main body.

Each of these divisions is almost entirely shut off from the others so far as the view is concerned, and each has its own characteristic appearance. The scenery in the lower (western) part of the lake is strikingly picturesque as viewed from a steamer at the centre of the cross (the *Kreuztrichter*). On the west towers the gloomy peak of Mount Pilatus, while on the east is the bright, garden-covered mountain of Rigi, far-famed for its unsurpassed view. Between them is seen the steep, forest-covered slope of the Bürgenstock. The water in this part of the lake is a clear blue. The water assumes a deep green hue in the Lake of Uri, which is surrounded by steep, rocky cliffs. Through the rifts in these cliffs can be viewed the snow-clad peaks and glaciers in the distance. The lake is subject to sudden and dangerous winds. The shores of the Lake of Uri are associated with the mythical history of William Tell. On its banks, also, in a spot called Grütli (q.v.), men from Uri, Unterwalden, and Schwyz pledged themselves in 1307 to drive out their foreign oppressors and thus paved the way for Swiss liberty. Along the eastern shore runs the Axenstrasse, celebrated as one of the most beautiful roads in existence. Its construction in the solid rock is a marvel of engineering skill. The principal affluent is the Reuss, which enters at Flüelen, and the lake discharges its waters from Lucerne into the Aar, a branch of the Rhine.

LUCHAIRE, lų′shâr′, Achille (1846–1908). A French historian, born in Paris. He was educated at the Superior Normal School (1866–69), taught in the lyceums at Pau and Bordeaux, and in 1877 received the degree of doctor of letters for his two theses, *De Lingua Aquitanica* and *Alain le Grand, sire d'Albret*. The same year he was appointed to the chair of history at Bordeaux and in 1885 became professor at the Sorbonne. He was chosen a member of the Academy of Sciences and was a laureate of the French Academy, the Academy of Inscriptions, and the Academy of Moral and Political Science. His publications include: *Noms de lieux du pays basque* (1874); *Recueil de textes de l'ancien dialecte gascon* (1881), with a glossary; *Histoire des institutions monarchiques de la France sous les premiers Capétiens, 987–1180* (2 vols., 1884); *Louis VI le Gros* (1889); *Les communes françaises à l'époque des Capétiens directs* (1890; new ed., 1911); *Manuel des institutions françaises: Période des Capétiens directs* (1892); *L'Université de Paris sous Philippe-Auguste* (1899); *Innocent III: Rome et l'Italie* (1904); *Innocent III: la croisade des albigeois* (1905); *Innocent III: la papauté et l'empire* (1906); *Innocent III: la question d'Orient* (1907); *Innocent III: les royautés vassales du Saint-Siège* (1908); *Innocent III: le concile de Latran et la réforme de l'église* (1908); *Social France at the Time of Philip Augustus* (Eng. trans., from part of a volume published in 1901, 1912). Consult Pierre Imbart de la Tour, "Achille Luchaire," in *Revue des Deux Mondes*, vol. lii (Paris, 1909).

LUCHU, LOO-CHOO, LIU-KIU, LIU-CHIU, or RIU-KIU. A chain of 55 islands (36 of them inhabited) which originally formed the Kingdom of Luchu, but which are now a part of the Empire of Japan. They lie in the Pacific Ocean between the parallels of 24.06° and 28.40° N. and the meridians of 122.45°

and 130.15° E. and extend in a southwest direction from Colnet Strait, which lies to the southwest of the island of Yakushima, towards the northeast coast of Formosa, from which they are distant 73 miles (Map: Japan, G 7). The total area is 941 square miles.

The chief islands are Amami-Oshima, Tokuno-shima, Okinawa-shima, Ishigaki-shima, and Iriomoto-shima. Okinawa-shima is 63 miles long and 14 wide, Amami-Oshima 34 miles long and 17 wide, Tokuno-shima 16 miles long and 8 wide, and Ishigaki-shima 24 miles long and 14 wide. The most important of these is Okinawa, on which Shuri, the capital, is situated. Okinawa-shima and the southern groups are of coral formation; but farther north the islands are of volcanic origin and rise steeply from the ocean. There are two islands with active volcanoes, but there are no evidences of recent volcanic activity elsewhere in the group. In some places the hills rise to heights of 1400 to 1500 feet, but in Okinawa the country is comparatively low and undulating, with rounded hills 400 to 500 feet in height. The prevailing rocks are gneiss, hornblende, and granite, overlain with much weathered sedimentary strata. Coralline limestone is abundant. The climate is healthful and pleasant; the mean temperature is about 70° F., the mean humidity 78°, and the rainfall for the year 84.69 inches. The islands suffer much from typhoons.

The soil is fertile and well cultivated. The most valuable crop is sugar. The largest is sweet potatoes, on which the great bulk of the population subsists; six kinds of rice, three of barley and wheat, and six sorts of beans are produced, as well as immense quantities of vegetables of all sorts, including gourds and melons. Two crops of rice a year can be grown. Cotton, Satsuma tobacco, and a little tea are also raised, but the main supply of tea comes from Japan. The sago palm is extensively cultivated, and oranges of a peculiar aromatic flavor are grown. Plantain trees furnish the fibre which the women weave into the principal fabric made on the island. This material is known as banana cloth and is much worn by the natives. Cotton cloth made in the islands is also a common article of clothing, and the pongee of native manufacture has high rank in the domestic markets. Fish of many kinds, including sharks, abound on the coast. Pigs are extensively reared; and an old law required each family to keep at least four pigs. Pork, however, is considered a luxury. There is a fine breed of ponies, 10 to 10½ hands high. There are no beasts of prey, but venomous snakes called *habu* abound and infest even the houses. They are from 6 to 7 feet long, 2½ to 3 inches in diameter, and their bite is speedily mortal.

The native people are probably of the same stock as the Japanese, whom they resemble to a great extent in their manners and customs. They are mild-mannered and courteous, and to the Chinese the Kingdom is known as the Land of Propriety. There is a remarkable absence of crime, the chief offenses being petty thefts. The people of the higher classes, especially the women, are as secluded as in China. Women tattoo their hands. The tombs are built of stone on the hillsides, and are horseshoe-shaped as in China. The dead are buried in coffins, but in the third year, when the flesh has rotted away, the bones are washed with saké and placed in urns.

The language is closely allied to Japanese, especially the Japanese of several centuries ago, and in both its accidence and syntax it greatly resembles Korean. It has no alphabet, Chinese having been for centuries the medium of communication, and Chinese literature, history, and philosophy the chief study of the learned. Two sects of Buddhism were introduced, but religion is now in decay, and there is hardly a temple or a shrine. The chief function of the priests is to officiate at funerals. Pop., at the close of 1903, 469,203; 1908, 502,309. Many of the islands are very densely populated, the average for the entire group being over 500 per square mile.

The Kingdom of Luchu first appears in Chinese history in the year 610, but little is known of it before 1187, when one Sunten, said to have been a son of the famous Japanese warrior Tametomo (q.v.), ascended the throne. In 1372 it became tributary to China, sending a mission to Peking every other year, and its kings receiving investiture from the Emperor. The first intimate relations with Japan began in 1451, when presents were sent to the Ashikaga Shoguns. In 1609 the islands became subject to the Daimyo of Satsuma, and from that time tribute was paid to both countries until 1874, when China relinquished her claims by treaty with Japan, and the Japanese garrisoned the chief city and its seaport. In 1876 Shotai, the King, was carried to Tokyo and made Marquis (died Aug. 19, 1901), and in 1879 the islands not already included in Kagoshima Prefecture were incorporated into the Japanese Empire; the ken or prefecture of Okinawa (q.v.) was established, and grouped with the nine provinces of Kiushu. Consult: *China Review*, vol. viii (Hongkong, 1879); *Transactions of the Asiatic Society of Japan*, vols. i, iv, xxi, xxiii, xxiv (Yokohama, 1874, 1876, 1893, 1895, 1896), Luchuan language and Luchuan bibliography; *Journal of the Society of Arts* (London, 1881); *Journal of the Royal Geographical Society*, vol. v (ib., 1895); *Imperial Geological Survey of Japan* (Tokyo, 1904); C. M. Salwey, *Island Dependencies of Japan* (London, 1913).

LUCIA DI LAMMERMOOR, lo͞o-chē′ȧ dė lăm′mẽr-mo͞or′. An opera by Donizetti (q.v.), first produced in Naples, Sept. 26, 1835; in the United States, Dec. 28, 1841 (New Orleans).

LUCIAN, lū′shan (Gk. *Λουκιανός*, *Loukianos*, Lat. *Lucianus*) (c.120–c.200 A.D.). The most brilliant representative of the revived Greek literature under the Roman Empire and one of the world's greatest wits. He was born at Samosata, the capital of the Syrian District of Commagene. Except for a casual denunciatory paragraph in Suidas, his biography must be reconstructed from his writings. In the charming little piece entitled "The Dream" he tells us how his parents, being poor, apprenticed him to his maternal uncle, who was a sculptor. One of his first careless strokes spoiled a fine slab of marble, whereupon his uncle proceeded to cudgel him, and the lad ran home weeping to his sympathetic mother. That night he saw in a dream two beautiful women contending for him—education (literary culture) and handicraft (for as such, in true ancient fashion, he esteemed the art of Phidias). Culture prevailed, and Lucian tells the story to one of the audiences of his successful prime, that poor boys may be encouraged by his example to aim at the highest. Rhetoric was the surest passport to all forms of distinction for a young provincial in the Roman

Empire of the second century. The young Syrian or Cappadocian who mastered the Greek language and acquired the faculty of fluent and pleasing discourse was no longer a barbarian, but a Greek and a member of an intellectual aristocracy that made him at home in Tarsus or Massilia, in Ephesus, Alexandria, or Athens. He had his choice of the two most honorable and lucrative professions of the day—that of the advocate and that of the sophist, or professor of rhetoric. Such was Lucian's life till about the age of 40. Of his practice at the bar of Antioch, to which Suidas alludes, he tells us nothing. But we catch glimpses of him as a popular lecturer and declaimer in Asia Minor, Greece, Macedonia, Italy, and Gaul. A few of his extant writings, by their trifling or purely formal character, would be classified as sophistic and presumably of this period. Such are the declamations on the Tyrannicides, on Phalaris, on "The Disinherited Son," the amusing encomium on the fly, the "Case of Sigma *vs.* Tau," and the "Lawsuit of the Vowels." Other little pieces scattered through his works seem like graceful introductions to more formal literary displays. Such may have been the "Dream," the "Herodotus," and the highly wrought descriptions of Zeuxis Hippocentaur, or of the house in which the speaker was entertained in Macedonia.

It was inevitable that Lucian should outgrow this trifling. It pleased him to represent the change as a conversion to philosophy, and in the "Nigrinus," a Platonic philosopher of that name (perhaps invented by Lucian), eloquently contrasts the life of unsatisfying and restless luxury led by the great at Rome with the philosophical peace and calm attainable at Athens. In the "Twice Accused" Rhetoric first brings suit against him for abandoning her, his lawful spouse. She had found him a little Syrian barbarbian knocking about Ionia and had made him a Greek gentleman and a prosperous man; and now he basely deserts her for Dialogus (philosophy). On the other hand, Dialogus complains that Lucian has dragged him down from high discourse about immortality in the Academy to employ him in dialogues upon vulgar and trivial themes and has impaired the purity of his native Platonic speech by Aristophanic jests and Menippean satire.

The dialogues thus aptly characterized by Lucian constitute the best-known and largest part of his extant work. There are 26 little *Dialogues of the Gods*, the humor of which consists in gravely accepting as facts the most grotesque anthropomorphic tales of mythology and deducing the consequences with Swiftian verisimilitude. Of a like character are the 15 dialogues of marine deities. The *Dialogues of the Dead* dwell with fierce and painful insistence on the impartial democracy of the grave, and the revelation that it brings of the nothingness of human life. In similar vein are the longer "Charon" and "Menippus." The *Dialogues of Courtesans* portray one of the darker sides of ancient life, largely in literary reminiscences from the new comedy. To the *Dialogues of the Gods* must be added the "Zeus Confuted," in which a cynic philosopher challenges Zeus to reconcile his own supremacy with the Homeric doctrine of fate; and the very amusing "Zeus in Tragics." In other cases the dialogue is the vehicle of satire on contemporary life—especially the pretensions and weaknesses of the philosophers and the superstitions of the multitude. Such are the "Day Dreams," the "Lie-Monger," the "Fishers," the "Sale of Lives" or auction of the Philosophies in the persons of their traditional representatives, the "Symposium" or "Banquet of Philosophers," which degenerates into a Donnybrook fair. Sometimes the dialogue form is abandoned for that of the essay, the biography real or fictitious, the narrative epistle to a friend, or the novelette. "How to Write History" combines many sensible precepts with entertaining satire. The "Demonax" is a biography of Lucian's ideal philosopher—perhaps invented by him. The letter on the death of Peregrinus (q.v.) describes the self-cremation at Olympia of a typical figure of the age, half religious mystic, half charlatan, for whom Lucian felt no sympathy in either character. The "Alexander," or "False Prophet," portrays the notable career of the impostor Alexander of Abonoteichos, who barely missed founding a new religion. There is a good account of it in Froude's *Short Studies*. The *True History* is a parody of the romances of the day, and itself the ancestor of Rabelais's *Voyage of Pantagruel*, Swift's *Gulliver's Travels*, and Cyrano de Bergerac's *Voyage to the Moon*. *The Ass* is a tale of Thessalian enchantments and adventures substantially identical with that of Apuleius' *Golden Ass*. See Apuleius; Golden Ass.

One of the most famous of Lucian's essays describes the petty miseries of the educated Greek who entered the service of one of the great Roman families as tutor. Towards the close of his life he himself accepted a lucrative post in the Roman administration of Egypt. A charming apology explains the inconsistency, or rather explains that there is none. A work entitled Λούκιος ἢ Ὄνος (*Lucius or the Ass*), once ascribed to Lucian, but no longer regarded as his, influenced largely the *Metamorphoses* of Apuleius (q.v.). Consult L. C. Purser, *The Story of Cupid and Psyche as Related by Apuleius*, xvii–xviii (London, 1910).

Of Lucian as a literary artist there can be but one opinion. He is one of the world's greatest writers of prose. His Greek syntax will not bear the microscope of the professional grammarian, but for literary purposes he writes correct enough Attic. His command of the resources of what was to him a dead language is amazing. He has every word and phrase of Plato, Aristophanes, and Demosthenes at his pen's end, and for purposes of literary allusion is master of all Greek literature and history. But he uses this scholarship as an artist and not as a pedant. He describes and narrates with incomparable vividness and vivacity, and his ingenuity, fancy, fertility of invention, and inexhaustible variety in vocabulary, allusion, and turn of idiomatic phrase never allow the attention to flag. Estimates of Lucian as a man and a thinker will depend on the philosophy of the critic. Lucian's temper is essentially negative and destructive. We may plead that he was a satirist and that, with the exception of Christianity, which it was impossible for him to estimate, he mocked only at folly or superstition. We may add that his denials imply a very strong positive belief in common sense, common honesty, good taste, and the great tradition of Greek art and literature. But to most readers this will seem a very small residuum of positive faith and enthusiasm among so many negations. Especially will Lucian be suspect to all those who take metaphysics seriously, or who, with Bacon, had rather believe all the fables of the Talmud than risk rejecting the kernel with the shell. The religion at which he mocked was either the outworn Hellenic mythology or the degrading Oriental superstitions which were competing for its place. The philosophers whom he satirized were unworthy successors of Plato and Zeno. But the Hermotimus (well paraphrased in an interesting chapter of Pater's *Marius*) shows that his skepticism went deeper, and that he had systematically closed his mind against all attempts of either philosophy or religion to transcend the world of sense and common sense. Renan praises him as the one man who in an age when even Marcus Aurelius coquetted with superstition remained unaffected by the taint. We may go further and say that there is no other example of a great writer (in contradistinction to a mere thinker) so utterly undisturbed by any visitings of vague yearnings, misgivings, sudden touches, thoughts beyond the reaches of our souls. There is a certain hardness, his warmest admirers must admit, in the brilliance of Lucian. He lacks the natural, human touch.

Bibliography. Lucian is generally read in the convenient three-volume Teubner text, edited by Jacobitz, who also edited the chief annotated edition (Leipzig, 1836–41). Another good edition is by Summerbrodt (1886–89). The best translations into English are that of Fowler (4 vols., Oxford, 1905), and that now in process in the Loeb Classical Library, by A. M. Harmon (vol. i, text and translation, New York, 1913). Professor B. L. Gildersleeve, in *Essays and Studies* (Baltimore, 1890), devotes a witty and entertaining chapter to Lucian; while Croiset's *Essai sur la vie et les œuvres de Lucien* (Paris, 1882) contains the fullest and best exposition and criticism. Consult also: W. W. L. Hime, *Lucian, The Syrian Satirist* (New York, 1900); F. G. Allinson, *Lucian, Selected Writings*, an annotated edition, with good Introduction on Lucian's life, works, and style (Boston, 1905); Sir R. C. Jebb, *Essays and Addresses* (Cambridge, 1907); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen litteratur*, vol. ii (5th ed., Munich, 1913).

LUCIAN, SAINT (?–312). A presbyter of Antioch. He was born at Samosata in the third century. Entering the ministry at Antioch, he founded and conducted a theological school. He became greatly celebrated as an ecclesiastic and biblical scholar. In the reign of Diocletian, by order of Maximin, he was arrested in Antioch, transported to Nicomedia, and tortured to death in prison, Jan. 7, 312. He made an important recension of the Greek text of the Old Testament, and is supposed to have had a share in the development of the New Testament text. Jerome speaks of him as also the author of several epistles and theological tracts. There has been dispute respecting his views of the Trinity, and it is a fact that Arius and the other founders of Arianism were his pupils, and that he lived apart from the Church during the episcopates of three successive bishops of Antioch. After his death he was enrolled in the calendar of the Church as a saint and martyr. His creed is given in Hefele, *History of the Councils* (Eng. trans., vol. i, Edinburgh, 1871 et seq.). Consult Harnack, *History of Dogma*, vols. iii, iv (Boston, 1897, 1899).

LUCIANI, lōō-chä'nē, LUIGI (1842–). An Italian physiologist, born in Ascoli-Piceno. He studied at the universities of Bologna and Naples and under Carl Ludwig at Leipzig. In 1874 he was appointed privat-docent in pathology at the University of Bologna, from 1875 to 1879 he was assistant professor at Parma, and in 1880 he became professor of physiology at the University of Siena. In 1882 he succeeded M. Schiff at Florence and in 1894 J. Moleschott at Rome. He also served as rector of the University of Rome and in 1903 was nominated Senator of the Kingdom. He contributed largely to the medical journals of Italy and Germany. Among his works are: *Dell' attivita della diastole cardiaca* (1871–74); *Fisiologia del digiono* (1889); *I preludi della vita* (1894); *L' acido fenico nelle febbri puerperali* (1904). Best known is his *Fisiologia dell' uomo* (1898–99; 3d ed., 1913), of which an American translation was published in New York as *Human Physiology* (vol. i, *Circulation and Respiration*, 1911; vol. ii, *Internal Secretion, Digestion, Excretion, the Skin*, 1913).

LUCIANI, SEBASTIANO. See SEBASTIANO DEL PIOMBO.

LUCID INTERVAL (Lat. *lucidus*, bright, from *lucere*, to shine). A period of time, of from an hour's to a few days' duration, during which an insane person appears sane in speech and act and in general manner and conduct. The forms of insanity in which a lucid interval occurs are generally characterized by exaltation or perversion. There may thus be a cessation or suspension of the fury or the motor and mental over-activity in mania; there cannot be repair or enlightenment of the obscurity in idiocy or dementia. It may consist in the mere substitution of clearness and calmness for violence and confusion; in the occasional recognition of his actual condition and external relations by the lunatic (orientation), or in the reëstablishment of intelligence and natural feeling so perfect and complete as to appear to differ from sanity solely in the want of permanence; but there invariably exists an undercurrent of unsoundness. It is found to be extremely difficult to distinguish this state from restoration to reason, except by reference to duration and the test of "insight." Legally these conditions have been held to be identical. A will executed during a lucid interval, although that was extremely transitory, and although the testatrix unloosed the straps by which her hands had been confined in order to execute the document, has been held to be valid. All that appears to be required, under such circumstances, is to prove that the conduct of the individual bore the aspect of rationality and health, and that the testator showed complete understanding of his act and of the property he was bequeathing, and made a proper disposition of it, in the opinion of the surrogate or judge of probate. It has been observed that immediately before death a very small proportion of the insane regain lucidity and die in possession of comparative sense and serenity. Consult: Shelford, *A Practical Treatise on the Law Concerning Lunatics, Idiots, and Persons of Unsound Mind* (London, 1833); Taylor, *The Principles and Practice of Medical Jurisprudence* (ib., 1873); E. C. Spitzka, *Manual of Insanity* (New York, 1887); Hamilton, *A Manual of Medical Jurisprudence* (ib., 1887); J. J. Reese, *Medical Jurisprudence and Toxicology* (Philadelphia, 1911). See INSANITY.

LU'CIFER (?–371). Bishop of Cagliari in

Sardinia and a zealous opponent of Arianism. He was born in Sardinia. In 354 he was sent by Liberius, Bishop of Rome, with Eusebius of Vercelli, to defend Athanasius at the Council of Milan, for which he was for a time imprisoned and then banished by the Arian Emperor Constantius to Syria, where, at Eleutheropolis, he composed his chief work, *Ad Constantium Augustum pro Sancto Athanasio.* In consequence of his bold and vehement invective he was sent to Egypt. Released from exile on the death of Constantius (361), he was commissioned by the Council of Alexandria to heal the divisions in the Church of Antioch, which had arisen from the dissensions between the Arians and the Orthodox. But he widened the schism by ordaining Paulinus to the see, for which he was rebuked by his friends. Chafing under the rebuke and displeased with the decree of the Council of Alexandria readmitting the former Arians who wished to be counted among the Orthodox, he retired in 363 to his native island of Sardinia and founded a small and short-lived sect called Luciferians, whose distinguishing tenet was that no Arian should be received into the Church. He died in Sardinia (371). His works are in Migne, *Patrol. Lat.*, xiii, and edited by Hartel, in *Corpus Scriptorum Eccl. Lat.*, vol. xiv (Vienna, 1886). Consult Krüger, *Lucifer Bischof von Cagliari* (Leipzig, 1886).

LUCIFER (Latinized form of Gk. Φωσφόρος, light bearer), or PHOSPHORUS. The morning star (the planet Venus). Hesiod makes Phosphorus son of Eos, the dawn, and Astræus; others call his father Cephalos. He is the favorite of Aphrodite, with whom he vies in beauty, and of whose temple he has charge. When the identity of the morning and evening star was recognized, Phosphorus and Hesperus (q.v.) were made brothers and were represented in art much like the Dioscuri. In the translation of a verse of Isaiah (xiv. 12) the word is used with reference to the glory of the King of Babylon. The passage runs in the Authorized Version as follows: "How art thou fallen from heaven, O Lucifer, son of the morning! How art thou cut down to the ground, which didst weaken the nations!" This was later understood to be the fall of Satan from heaven, and thus the word Lucifer has come to be used to denote the fallen archangel. In this sense it was used by Milton and many others.

LUCILE, lû-sēl′. A narrative poem by Lord Lytton (Owen Meredith), published in 1860. Practically a French novel with the personages altered, the diction and many of the incidents were taken from the *Lavinia* of George Sand.

LUCIL′IUS, sometimes called LUCILIUS JUNIOR. A friend and correspondent of Seneca (q.v.), the tragic writer and philosopher. To him Seneca addressed his *Epistulæ Morales* and his essays *De Providentia* and *Naturales Quæstiones.* A poem, *Ætna*, on the volcano of that name, has been by some ascribed to him: for a criticism of this view, consult: H. E. Butler, *Post-Augustan Poetry* (Oxford, 1909); Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (3d ed., Munich, 1911).

LUCIL′IUS, GAIŬS (c.168–103 B.C.). A Roman poet, born at Suessa Aurunca (Sessa), in the northwestern part of Campania, Italy. He was of the equestrian order and the maternal granduncle of Pompey the Great. In 133 he served under Scipio Africanus Minor at the siege of Numantia. He is generally considered the originator of Latin satirical composition, at least of that form adopted by Horace, Persius, and Juvenal. (See LATIN LITERATURE; SATIRE.) His satires were popular in the Augustan age, and even as late as the time of Quintilian (see Quintilian, x, i, 93–94); to him Horace, Juvenal, and Persius were much indebted as satirists. His style was distinguished by great energy of expression, but was deficient in elegance and clearness. The two most important features of his work were the adoption of the heroic verse as the vehicle of satire and the tone of censoriousness which marked his writings. (See the paragraph on Lucilius, in LATIN LITERATURE.) An attractive feature reproduced in Horace's *Sermones*, is the frankness with which he talks of himself. He attacked vice with great severity. He was on intimate terms with Lælius Sapiens and Scipio Africanus Minor. (See Horace, *Sermones*, ii, i, 62–74.) His works consist of 30 books of satires, a comedy, epodes, and hymns, none of which is extant except 800 fragments of his satires, the longest of which has only 13 verses. These have been collected and published by R. and H. Stephens in their *Fragmenta Poetarum Veterum Latinorum;* by Müller (Leipzig, 1872); by Merry (London, 1891); and, best of all, by Marx (2 vols., Leipzig, 1904–05). Marx's edition has elaborate Prolegomena and full Latin notes. Consult: Müller, *Leben und Werke des Gaius Lucilius* (Leipzig, 1876); Patin, *Etudes sur la poésie latine*, vol. ii (Paris, 1883); W. Y. Sellar, *Roman Poets of the Republic* (3d ed., Oxford, 1889); Cichorius, *Untersuchungen zu Lucilius* (Berlin, 1908); Martin Schanz, *Geschichte der römischen Litteratur*, vol. i, part i (3d ed., Munich, 1907). For a criticism of the works by Marx and Cichorius, consult Charles Knapp, in *The American Journal of Philology*, vol. xxix (New York, 1908). On the relation of Horace and Persius to Lucilius, consult G. C. Fiske, "Lucilius and Persius," in *Transactions of the American Philological Association*, vol. xl (Boston, 1909), and id., "Lucilius, The Ars Poetica of Horace and Persius," in *Harvard Studies in Classical Philology*, vol. xxiv (Cambridge, Mass., 1913).

LUCI′NA (Lat., she who pertains to light, or the light bringer, from *lux*, light). In Roman mythology, the surname of Juno (q.v.) as the goddess of light, and especially as the deity who presided over the birth of children. This function of Juno Lucina became so prominent that the surname came to have the same meaning as Εἰλείθυια (*Eileithyia*) in Greek. At the birth of a child a payment was made at Juno's temple, and women sacrificed to her after a safe delivery. The name was given also to Diana, conceived of as a birth goddess.

LUCIUS, lū′shĭ-ŭs. The name of three popes. —LUCIUS I. Pope probably from June 25, 253, to March 5, 254. That he was banished for a time is evident from a letter of Cyprian in congratulation upon his release from exile. The assertion that he died a martyr's death cannot be proved. From Cyprian it appears that he was in favor of the complete restoration to the Church of the lapsed who fell away from the faith under heathen persecution. Consult Lipsius, *Chronologie der römischen Bischöfe bis zur Mitte des vierten Jahrhunderts* (Kiel, 1869).

LUCIUS II (Gherardo Caccianamichi dal Orso). Pope, 1144–45. He first appears prominently in 1124–30 as Cardinal Presbyter of

Santa Croce and legate of Honorius II to Germany. In 1130 he became a partisan of Innocent II, who at Honorius' death was elected Pope, against the Antipope Anacletus II. He was rewarded by appointment as librarian and chancellor of the holy see. He succeeded Celestine II as Pope, but proved unequal to the difficulties resultant from the confused state of affairs at Rome. A revolt broke out, Giordano Pierleone, its leader, was chosen *patricius*, and a new Senate was elected (*Renovatio sacri senatus*). Lucius was asked to relinquish his exalted rights and privileges and content himself with the tithes and oblations of a bishop of the primitive Church. He refused, vainly sought aid from the Emperor Conrad III, and finally enlisted the Frangipani, enemies of Pierleone, in his behalf, but died before the decision of the contest. He was succeeded by Eugenius III. Consult F. Gregorovius, *Rome in the Middle Ages* (London, 1896).

Lucius III (Ubaldo Allucingoli). Pope, 1181–85. During his pontificate the struggle was continued for the great estates bequeathed by the Countess Matilda of Tuscany to the holy see (1115) and contested by the Emperor Frederick Barbarossa. Lucius replied to an offer of compromise from the Emperor by demanding the immediate surrender of the estates. This Frederick, with the existence of the Empire in central Italy at stake, refused. A conference held at Verona in October, 1184, resulted in no solution. Frederick, however, acceded to the Pope's request to begin preparations for a crusade to rescue Palestine from Saladin. He also preached a bitter crusade against the heretical Waldensians. Lucius was expelled from Rome through insurrection, and, although he obtained money from England to maintain warfare against his opponents, afterward resided mainly at Verona, Anagni, and Velletri.

LUCIVEE, lo͞o'sĭ-vē'. A name in New England and Quebec, corrupted from the French *loup cervier* (deer wolf), for the wild cat of that region—the Canadian lynx. See Lynx.

LÜCKE, ly̆'ke, Gottfried Christian Friedrich (1791–1855). A German commentator. He was born at Egeln in the Duchy of Magdeburg, studied theology at Halle and at Göttingen. In 1818 he was made professor of theology at Bonn and devoted himself with enthusiasm to the study of exegesis and Church history. In 1827 he became professor of theology at Göttingen and died there Feb. 14, 1855. His chief work was a commentary, in four volumes, on the writings of St. John (1820–32; partly translated, Edinburgh, 1837). In his *Einleitung in die Offenbarung Johannis* (1832) he denied the Johannine authorship of Revelation. His library is now at Harvard.

LUCKEN GOWAN. See Globeflower.

LUCKENWALDE, ly̆k'en-väl'de. A town of the Province of Brandenburg, Prussia, situated on the river Nuthe, 30 miles south-southwest of Berlin (Map: Germany, E 2). It has important cloth, woolen, and hat factories, machine shops, iron foundries, manufactures of screws, paper, cardboard, pianos, lumber, and cabinetwork, and a large horticultural industry. Pop., 1900, 20,986; 1910, 23,476.

LUCKNER, ly̆k'nẽr, Nikolaus, Count (1722–94). A French soldier, born at Cham, Bavaria. He entered the Bavarian army, then that of Holland, and distinguished himself as the commander of a corps in the Seven Years' War. In 1763 he joined the French army with the rank of lieutenant general, and a year later he was ennobled. In 1791 he was made a marshal and in 1792 took command of the national troops in the north of France. He soon was replaced by Kellermann and was reprimanded by the Convention for his inadequate success. In January of the next year he was guillotined.

LUCKNOW, lŭk'nou. The western division of Oudh, United Provinces, British India; central district in this division; a city, capital of the district and division. The division consists of the following districts: Lucknow, Unao, Rae Bareli, Sitapur, Hardoi, and Kheri. Its area is 12,051 square miles. Pop., 1881, 5,325,601; 1891, 5,856,559; 1901, 5,977,177; 1911 (census of March 10), 5,911,642. In 1901, about 87 per cent of the inhabitants were Hindu, and nearly 13 per cent Mohammedan. Lucknow District consists of three tahsils—Lucknow, Malihabad, Mohanlalganj; its area is 967 square miles. Pop., 1881, 696,824; 1891, 774,163; 1901, 793,241; 1911, 764,411. In 1901, about 78 per cent were Hindu and over 20 per cent Mohammedan. Lucknow Tahsil, in which is situated Lucknow City, has an area of 360 square miles.

Lucknow City, formerly capital of the Province of Oudh, is situated in lat. 26° 52′ N. and long. 80° 56′ E., on the right, or south, bank of the Gumti, 42 miles northeast of Cawnpore, 666 miles northwest of Calcutta, and 885 miles northeast of Bombay by rail (Map: India, D 3). It is the junction of several railway branches connecting the systems of Rajputana and Behar. The city covers a large area and has suburbs on the opposite bank of the river, which is spanned by several bridges. From a distance Lucknow has an appearance of architectural splendor; a nearer view, however, discloses a crowded Oriental town with the squalor of numerous narrow streets and mean dwellings, while some of the buildings which appeared most notable prove to be inferior edifices in brick and stucco. Until the time of the Mutiny the northern part of the city, along the river, was occupied by bazars, but these have been succeeded by handsome parklike spaces reaching back from the water for about half a mile. In the west end is the Jama Masjid, the unfinished mosque of Mohammed Ali Shah, which is notable only for its size and gaudy coloration. The Husainabad buildings, also erected by Mohammed Ali Shah, include his tomb and that of his daughter, which represents a poor attempt to imitate the Taj Mahal at Agra. Victoria Park extends eastward from Husainabad to the Rumi Darwaza. The latter, a beautiful mosque, and the great Imambara constitute the finest architectural group in Lucknow; they were built by Asaf-ud-daula. The Rumi Darwaza is the splendid and massive gateway (sometimes called the Constantinople Gate) leading into the Machchhi Bhawan, or great fort, in which are situated the other buildings. The great Imambara, in which Asaf-ud-daula is buried, consists of a hall, 162 feet long and 54 feet wide, with broad verandas on either side and large octagonal apartments at the ends; no wood was used in the construction of the building. From the Machchhi Bhawan radiate three military roads, which immediately after the Mutiny were cut through the native city. Half a mile southeast of the Machchhi Bhawan are ruins of the Residency, with tombs or cenotaphs of some 2000 Europeans who perished in the Mutiny. To the east of the Residency are the great palaces Farhat Bakhsh (only portions of which remain) and Chhattar Manzil, which are now used for the purposes of a club, museum, etc. One of the existing portions of the Farhat Bakhsh was the throne room of the Oudh kings. A little to the south are the tombs of Saadat Ali Khan and his wife; behind these are the Canning College and the quadrangle forming the Kaisar Bagh (1848–50). The latter is partly destroyed; of little merit, it was the largest and gaudiest of the Lucknow palaces. Eastward are other buildings and tombs of some note and public gardens, and southeast of these is the enormous and bizarre Martinière College. This was built in the time of Asaf-ud-daula by Gen. Claude Martin as his own residence, a Frenchman who rose to power and wealth under the native and British authority. The civil station, which has a fine street lined with European shops, adjoins the city on the east. The cantonment, the largest in the United Provinces, is garrisoned by all three branches of the service.

Formerly Lucknow was famous for its production of costly jewelry and rich fabrics, and it still has important products in silver, copper, and brass wares and in embroidery with gold and silver thread, while many cotton fabrics, from coarsest to finest, are manufactured. Artistic clay figures representing types of native life are produced. There are a few important European maufactories, the largest being the railway shops. During the latter half of the nineteenth century considerable improvement was effected in the sanitary conditions of the city, which has control of the water works. Lucknow is an important educational centre. The chief institution is the Canning College, which was founded in 1864 and has five departments. Also should be mentioned the Colvin School, the Reid Christian College (Methodist), the Jubilee High School, and a normal school. In addition there are various other mission and native schools of good quality. The principal school for Europeans and Eurasians is the Martinière. There is an exceptionally well-equipped hospital. Lucknow has been administered as a municipality since 1864. Pop., 1869, 284,779; 1881, 261,303; 1891, 273,028; 1901, 264,049. Of the latter number, 154,167 were Hindus, 101,556 Mohammedans, and 7247 Christians (of whom 5097 Europeans or Eurasians); of the total, 23,400 were included in the cantonment. The census of 1911 showed a total population of 259,798.

Although Lucknow is conspicuous by an absence of antiquities, it is understood to be older than any other of the great Indian cities; according to tradition, it was founded by Lakshmana, brother of Rama Chandra. From 1775 it was the capital of the Kingdom of Oudh until the annexation by the British in 1856. During the Mutiny of 1857 Lucknow surpassed every other station in the energy and obstinacy of the defense by the British garrison against the insurgents. Intrenched in the Residency, now one of the show places of the city, for 12 weeks 1700 men held out against a besieging force of over 10,000, until reënforced in September by new troops under Generals Havelock and Outram. The siege, however, was not raised, but continued until Sir Colin Campbell reached the city two months later and enabled the garrison to withdraw. The city was regained by the British in March of the following year. Consult J. J. M. Innes, *Lucknow and Oudh in the Mutiny* (London, 1895).

LUCK OF EDEN HALL, The. A tenth-century Venetian drinking glass, preserved in the Musgrave family at Eden Hall, Cumberland, England. The legend relates that it was stolen from the fairies, and that the fortunes of the house are closely bound up with it. Under the title Longfellow translated Uhland's ballad (1834) *Das Glück von Edenhall*.

LUCKY GOWAN, gou′*a*n, or Lucken Gowan. See Globeflower.

LUCRECE, lû-krēs′, The Rape of. A poem by Shakespeare, based on the story of the wife of L. Tarquinius Collatinus. It was printed in 1594 with a dedication to the Earl of Southampton.

LUCRETIA, lû-krē′shĭ-ȧ. The most famous heroine in early Roman story. She was the wife of L. Tarquinius Collatinus (of Collatia), a member of a collateral branch of the Tarquinian royal family. When the Roman army was besieging Ardea, the young nobles in their camp fell into a discussion regarding the character of their wives and resolved, in a lull in the hostilities, to ride back and come upon them by surprise. At Rome they found the King's daughters feasting and making merry; then they hastened to Collatia, where Lucretia was spinning among her slaves. Thereupon they returned to the camp; but the infamous Sextus Tarquinius, one of the King's sons, fired by an ignoble passion, returned secretly to Collatia and in the dead of night entered Lucretia's room and forced her, under a horrible threat, to comply with his desires. But no sooner had he left than Lucretia aroused the household, summoned her husband and father, and related what had happened. Then, making them swear to avenge her, she stabbed herself and died. When the facts were known, the indignant people arose against the Tarquins, whom they expelled from the city, and established the Republican government (c.509 B.C.). The story is told by Livy, i, 57–59. For criticisms of the story, consult the references in "Lucretius, 2," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914). See Brutus, Lucius Junius.

LUCRETIA; or, The Children of the Night. A novel by Bulwer (1846).

LUCRETIA GENS (Lat., Lucretian clan). One of the oldest gentes of Rome, originally patrician, but subsequently plebeian as well. The patrician surname was Tricipitinus; the plebeian families bore the surnames Gallus, Ofella, and Vespillo. The cognomen of the poet Lucretius was Carus.

LUCRE′TILIS MONS. A mountain in the Sabine territory, visible from the Sabine farm of Horace (q.v.), made famous by Horace's reference to it in *Carmina*, i, 17, 1. It is usually identified with Monte Gennaro, a conspicuous limestone peak, 4160 feet high, northeast of Rome.

LUCRE′TIUS (Titus Lucretius Carus) (c.99–c.55 B.C.). A Roman poet of the first rank. Of the details of his life practically nothing is known. An entry in the chronicle of St. Jerome, under the year 94 B.C., records "the birth of the poet Lucretius, who lost his reason through a love philtre. After composing in the intervals of his madness several books which Cicero subsequently edited, he died by his own hand in his forty-fourth year." But Donatus, in his life of Vergil, says that Lucretius died in 55; and this date is rendered probable by the fact that the first mention of his poem occurs in a letter of Cicero to his brother, written February, 54. The dates 99–55 may thus be accepted as approximately correct. De Quincey, in his essay on Keats, expresses his admiration for Lucretius as "the first of demoniacs" and holds that "the characteristic manner of his poem, even if all anecdotes had perished, would have led an observing reader to suspect some unsoundness in his brain." And it is, indeed, generally agreed that the *De Rerum Natura* shows such unrelieved intensity of thought and feeling, coupled at times with such sombreness, as to make quite credible the tale of madness and suicide, though not necessarily for the cause assigned. On the other hand, the masses of varied and disparate facts are logically arranged, the reasoning, whether inductive or deductive, is clear and consecutive, and the entire poem (of about 7500 lines) shows marked symmetry of design and execution. The composition of so extensive a work *per intervalla insaniæ* seems most unlikely. It is certain, however, that, as Lachmann first proved, the poet did not live to put the final touches to his work. Of many paragraphs there are double drafts, many arguments are not adjusted to their context, and the workmanship is in many details rough and inartistic. The lack of finish is especially noticeable in the later books. It is evidently impossible to determine exactly to what extent the posthumous editor is responsible for the existing text.

The *De Rerum Natura*, the single poem into which Lucretius poured the passion of his life, is an attempt to vindicate for man his independence of thought and action by proving the soundness and adequacy of the Epicurean philosophy. Lucretius holds that, if the true nature of the gods is once made clear, by proof that their "happy, careless lives" are in no way concerned with the government of the universe, for the reason that everything happens in accordance with fixed laws of nature and not by divine intervention, and that, if the true nature of the soul is once made clear, by the demonstration also, that the soul, like everything else, is composed of atoms and is therefore subject to the universal law of birth and death, then at once man, set free from the fear of the gods both here and hereafter, absolute master of his fate in this the only world that he is to know, has it in his power to live a life of noble simplicity. The proof that man is thus "lord of himself" depends ultimately upon the atomic theory (see CHEMISTRY) formulated originally by Leucippus and Democritus and later modified by Epicurus. The demonstration of scientific facts and principles is therefore of vital importance, and the greater part of the poem is inevitably devoted to discussions for which prose would have been a more natural medium. But the poet's towering enthusiasm and remarkable power over language have forced into the hexameter verse elements seemingly unmanageable.

The poem is divided into six books. In book i Lucretius states as the basis of his system the two propositions that "out of nothing nothing can be created, even by divine power," and that no existing thing can be reduced to nothing, but only to its ultimate elements. The first of these principles becomes more intelligible if stated affirmatively; Lucretius means that back of all phenomena in the world lies something else, which adequately accounts for them, so that no room is left for the assumption that the phenomena are due to the gods. The ultimate elements of the universe are two, void and atoms. The latter are infinitesimally small, indivisible, and indestructible. They are, further, infinite in number and variety, as void or space is infinite in extent. Thus, the universe has no centre, as the Stoics thought. Lucretius postulates the existence of void, because without void motion, and so life, would be impossible. Book ii deals with the motions of the atoms, the diversity of their shapes, and their modes of combination. In the discussion of their motions, the famous theory of the *clinamen*, or "swerve" from the straight parallel lines naturally followed by bodies falling in space, is introduced to account for their initial contact; and upon this power, inherent in the atom, is based the freedom of the human will. The atoms differ in size, weight, and shape only, and have no secondary qualities. Sensation in living beings is a function of certain special atomic combinations. As space and matter are infinite, the whole universe is filled with systems like our own. In book iii Lucretius presents a long series of arguments to prove that the soul is material and is composed of very minute and mobile atoms, and is so intimately associated with the body that each is vitally affected by the other and neither can survive separation. The closing 260 lines of this book, in which, on the basis of all that has been said in the poem, the right attitude towards death, as the end of consciousness, is passionately urged, is perhaps the noblest passage in Latin literature. The fourth book is a continuation of the third and explains the widespread belief in the continued existence of the souls of the dead in connection with the theory of sense perception in general. The adaptation of the senses to their functions, however, does not justify the inference of design. The action of the mind during sleep is explained, and the book concludes with a vivid picture of the disastrous results of indulging the passion of love. Book v, to the modern mind in many ways the most remarkable in the poem, ascribes the formation of our system (which, composed of perishable parts, will some day cease to exist), not to creative intelligence, but to countless chance combinations of atoms. After the emergence of the earth, sea, sky, sun, and moon from the primal confused mass, or chaos, animal as well as vegetable life was produced directly from the earth; but many of these forms of animal life were unable to defend themselves and so became extinct. The condition of primitive man is described, and then his gradual advance in civilization, the origin of language, discovery of fire, beginnings of civil society, of religion, and of the arts, use of the metals, weaving, agriculture, and music. Everything in the constitution of the world and in the life of man is thus shown to be due to natural causes, not to divine activity. With the same purpose in view, book vi is devoted to those natural phenomena that are usually ascribed to the agency of the gods, especially thunder and lightning, earthquakes, volcanic eruptions, the rising of the Nile, and the power of the magnet. The discussion of the spread of disease leads to an impressive account of the great plague at Athens, at the beginning of the Peloponnesian War, based upon the account given of that plague by Thucydides. With this the book and the poem abruptly end.

The permanent value of the work of Lucretius is not due to its scientific discussions, though it is to these that the greater part of the poem is devoted. It is true that the atomic theory of Democritus and Epicurus (Lucretius did not himself make any contribution to this theory) has proved to be the most fruitful of all ancient physical theories, and that many of the general principles enunciated in the first two books of the poem, such as the doctrine of the indestructibility of matter, are in striking accord with modern science; it is true, also, that the brilliant outline of anthropology given in the fifth book still seems essentially correct. But in countless details he is wrong, even absurdly wrong. Scientific method was as yet little understood; and Lucretius in this respect was not in advance of his time. He possesses, however, in high degree the scientific temper and the scientific imagination. No thinker has more firmly grasped the universality of law, none takes greater delight in the discovery of facts and the determination of their meaning and connection. Almost alone among the Romans, he has an inborn taste and capacity for philosophical speculation, and his mind moves through the intricacies of a subtle argument with a sureness that rouses admiration.

Neither is the special merit of Lucretius to be found in his literary art, although the *De Rerum Natura* is a splendid monument of pure and virile Latinity. He was evidently a wide reader, both in Greek and in Latin, and well versed in the traditions of the poet's craft. The diction and rhythm of Ennius, in particular, had a great attractiveness for him, and the poem of Empedocles (q.v.) *On Nature* probably determined the form of his own. While he himself avowedly regards his poetry as merely a help to the effective exposition of his philosophy, the numerous digressions, in which he has expressed his deepest musings on human life, as well as countless touches in the scientific portion proper, all reveal poetical powers of the highest order. The cadence of the hexameter lacks, of course, the music and variety that Vergil was to put into it. The verse is sometimes monotonous, but more often its ruggedness and majesty harmonize admirably with the thought.

Lucretius was an earnest seeker for the truth, but it was in the spirit of the typical Roman, for a definite practical end, the emancipation of mankind from the bondage of superstition. Against the anthropomorphic deities of popular religion, arbitrary and vengeful, he wages war with a fervor, or rather fury, that is almost startling. Epicureanism seems to him "a healing gospel"; he is its preacher. But the seriousness and exaltation of his nature make of it really a new philosophy. Life has too solemn a meaning to be spent in the quest of pleasure, however refined. Fortitude and renunciation are its true watchwords. The enduring interest of the poem is thus a psychological one and is due to the unconscious self-portrayal of one of the noblest minds in history.

The *editio princeps* was published at Brescia in 1473. The most important of the early editions are the first Aldine (1500), edited by Avancius, the Giunta (1512), by Candidus, and those of Lambinus (Paris, 1563; 3d ed., 1570). But all modern editions are based on that of Lachmann (Berlin, 1850; 4th ed. of the text, 1871; of the commentary, 1882). The text was edited for Teubner by Bernays (Leipzig, 1852) and by Brieger (Leipzig, 1894; 2d ed., 1899). The most helpful editions to-day are those of H. A. J. Munro (3 vols., text, commentary, translation; 4th ed., London, 1886); C. Giussani (2 vols., text and admirable commentary and introductions, Turin, 1896–98); W. A. Merrill (New York, 1907). Book iii has been specially edited by Heinze (Leipzig, 1897).

Bibliography. Constant Martha, *Le poème de Lucrèce* (Paris, 1873); William Wallace, *Epicureanism* (London, 1880); Eduard Zeller, *Stoics, Epicureans, and Sceptics,* translated by Reichel (ib., 1880); John Masson, *The Atomic Theory of Lucretius* (ib., 1884); F. A. Lange, *History of Materialism and Criticism of its Present Importance,* translated by E. C. Thomas (3d ed., 3 vols., ib., 1890); C. Giussani, *Note lucreziane* (Turin, 1900); John Masson, *Lucretius: Epicurean and Poet* (2 vols., London, 1907–09); Martin Schanz, *Geschichte der römischen Litteratur,* vol. i, part ii (3d ed., Munich, 1909). On Lucretius' language, consult K. C. Reiley, *Studies in the Philosophical Terminology of Lucretius and Cicero* (New York, 1909). Consult, also, Tennyson's poem *Lucretius* and W. H. Mallock, *Lucretius on Life and Death* (London, 1900). A good English translation is that by Cyril Bailey (Oxford, 1910).

LUCREZIA FLORIANI, lo͞o-krā′tsē̇-ȧ flō′rē̇-ä′nē̇. A partially autobiographic novel by George Sand (1847).

LUCRINE LAKE. See Lucrino, Lake.

LUCRINO, lo͞o-krē′nō̇, Lake (also Lake Lucrine; ancient *Lacus Lucrinus*). A small salt-water lake in Italy, 10 miles west of Naples and separated from the Gulf of Pozzuoli by a narrow dam of sand. In ancient times it was famous for oysters, and they are now cultivated there. In the time of Augustus Agrippa connected Lake Lucrinus with Lake Avernus (q.v.) and with the Bay of Cumæ (Sinus Cumanus), thus forming the Julian harbor (Portus Julius), celebrated by Horace and Vergil. The canals and wharves were entirely destroyed in 1538 by the volcanic upheaval of Monte Nuovo that half filled up Lake Lucrino.

LUCUL′LUS, Gardens of (Lat. *Horti Lucul-liani*). Famous pleasure grounds on the slope of the Pincian Hill at Rome, laid out with lavish expense, about 60 B.C., by Lucullus (q.v.), and completed by Valerius Asiaticus (46 A.D.). They contained a palace, porticoes and libraries, a banqueting hall, and a palace which afterward became the favorite residence of Messalina (q.v.). Of these buildings only a few pieces of wall and some mosaic pavement under neighboring streets remain. The famous Scythian sharpening his knife, now in the Tribune of the Uffizi, at Florence, and the head of Ulysses in the Vatican were found on the site of the gardens.

LUCULLUS, Lucius Licinius (c.110–c.57 B.C.). A distinguished Roman general. He fought with distinction under Sulla in the Social War (q.v.). In the First Mithridatic War he commanded the fleet as legate of Sulla. In 77 B.C. he filled the office of prætor, and immediately after held the administration of the Province of Africa. In 74 B.C. he was chosen consul along with Marcus Aurelius Cotta, and received Cilicia for his province, while Cotta had Bithynia. Both consuls arrived in Asia about the close of 74 B.C. Cotta was soon after utterly defeated by Mithridates, who had burst into Bithynia at the head of 150,000 troops. Cotta was forced to take refuge in Chalcedon, and was besieged by Mithridates. Lucullus, however, advanced to his relief at the head of 35,000 men, compelled Mithridates to raise the siege, and almost annihilated his army on its retreat. In 71 B.C. Pontus became subject to the Romans. The measures which Lucullus now introduced in the government of the Province of Asia, to secure the provincials against the fearful oppressions and extortions of farmers of the taxes (see Publicani) and usurers, especially his fixing a uniform and moderate rate of interest for all arrears, show that he was a just, wise, and humane administrator; but, though the cities of Asia were grateful for his clemency, the equestrian order in Rome (who had the farming of the taxes) became implacably hostile to him, and his own troops grew disaffected on account of the strictness of his discipline. In the spring of 69 he marched into Armenia with a small force of 12,000 foot and 3000 horse, and gained a complete victory over Tigranes (q.v.), who was at the head of an army of 220,000 men. In the following year he gained another great victory at the river Arsanias over a new army led against him by Tigranes and Mithridates; but the mutinous spirit of the legions—in spite of these splendid triumphs—daily increased. Lucullus now wanted to besiege Artaxata, the capital of Armenia, but the soldiers refused to advance farther. After this he could do nothing; not a soldier would serve under him. At last he was superseded by Pompey, and left Asia 66 B.C. The cabals of his enemies so much prevailed against him that he was three years in Rome before he obtained his triumph. In conjunction with the aristocratic party he attempted to check the increasing power of Pompey, and the attempt caused the coalition known as the first triumvirate. But he was ill fitted to act as leader against such unscrupulous men, and soon withdrew altogether from political affairs. During his public career he had acquired (but not unfairly) prodigious wealth; and he spent the remainder of his life surrounded by artists, poets, and philosophers, and exhibiting in his villas at Tusculum and Neapolis, and in his house and gardens at Rome (see Lucullus, Gardens of), a luxury and splendor which became proverbial. He wrote, in Greek, a history of the Social War (q.v.). He is one of the interlocutors in Cicero's *Academica.* His life was written by Plutarch (q.v.). Consult Ménard, *Histoire de la luxe privée* (4 vols., Paris, 1880-84), and the article "Licinius, 30" in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

LUCUS AUGUSTI. See Lugo.

LUCUSTA. See Locusta.

LU'CY, Sir Henry (William) (1845-). An English journalist. He was born at Crosby, studied at the Crescent School and in Paris and in 1864 joined the staff of the Shrewsbury *Chronicle.* In 1870 he went to London and joined the staff of the *Pall Mall Gazette.* He became known as the contributor, over the signature Toby, M.P., of the amusing "Essence of Parliament," the *Punch* department originated by Shirley Brooks. In 1881 he became one of the *Punch* staff. For a year (1886) he was editor of the *Daily News.* In 1901 he joined the staff of the *Daily Telegraph* and continued his parliamentary descriptive articles. His publications include: *Men and Manners in Parliament* (1875); *Gideon Fleyce* (1882), a novel; *East and West* (1885); *Mr. Gladstone: A Study from Life* (1896); *Peeps at Parliament* (1903); *Memories of Eight Parliaments, 1868-1906* (1908); *Sixty Years in the Wilderness* (1909; 2d series, 1912; 3d series, *Nearing Jordan,* 1914).

LUCY, Sir Thomas (1532-1600). An English knight known in connection with Shakespeare. On the death of his father (1552) he succeeded to the estate of Charlecote, about 4 miles from Stratford-on-Avon; rebuilt the manor house; was knighted by Elizabeth (1565); became high sheriff of Worcestershire (1586), where his wife held property; was justice of the peace for Warwickshire; and sat in two Parliaments (1571 and 1584). According to tradition, Shakespeare stole deer from Lucy's park (about 1585), and as a result found it convenient to leave Stratford. With little doubt Shakespeare took Lucy as his model for Justice Shallow. Consult *Henry IV*, part ii, *The Merry Wives of Windsor*, and Sir Sidney Lee, *Life of William Shakespeare* (New York, 1909).

LUD'DITES (named from Ned Lud, a half-witted man, who in a fit of rage broke two stocking frames). The name first assumed in 1811 by bands of English workmen organized for the destruction of machinery.

The risings were due in part to a general industrial depression and in part to the want of employment caused by the displacement of hand labor through the introduction of machinery. At Nottingham the Luddites first made their appearance. From Nottingham, between the autumn of 1811 and the summer of 1812, the riots spread to the counties of Derby and Leicester, and to Cheshire, Lancashire, and Yorkshire. They were met by the enactment of harsh penal laws. It was made a capital crime to destroy any sort of machinery used in factories, and in 1812 17 men were hanged together in York. Owing to the failure of the harvests and to the economic depression following the close of the Napoleonic wars, in 1816 the riots broke out again on a much larger scale, and eventually spread over nearly the whole Kingdom. Consult: *The Annual Register* for 1811, 1812, and 1816 (London, 1811-16); George Pellew, *Life of Henry Addington, Viscount Sidmouth,* vol. iii (ib., 1847); Peel, *The Risings of the Luddites, Chartists, and Plug-Drawers* (2d ed., ib., 1888).

LÜDEMANN, lu̥'de-màn, Hermann (1842-). A German Protestant theologian, born at Kiel (Prussia). After study (1861-67) at Kiel, Heidelberg, and Berlin, he was appointed a lecturer at the first-named university in 1872 and a professor of New Testament exegesis in 1878. In 1884 he became professor of Church history at Bern, where later he received appointment to the chair of systematic theology and the history of philosophy in the theological faculty (1891). His position became in general that of the Jena school, critical and liberal in both instruction and writings, which latter include: *Die Anthropologie des Apostel Paulus* (1872); *Die Eidbrüchigkeit unserer neukirchlichen Geistlichen* (1881; 3d ed., 1884); *Die neuere Entwicklung der protestantischen Theologie* (1884); *Was heisst "biblisches Christentum?"* (1905); *Religion und Leben* (1908); *Die Erkennen und das Werturteil* (1910).

LUDEN, lo͞o'den, Heinrich (1780-1847). A

German historian. He was born in Loxstedt, was educated at Göttingen, and from 1806 till his death was professor of history at Jena. His writings include: the *Handbuch der allgemeinen Geschichte der Völker und Staaten des Altertums* (1814; 3d ed., 1824); *Allgemeine Geschichte der Völker und Staaten des Mittelalters* (1821–22; 2d ed., 1824); *Die Geschichte des deutschen Volkes* (12 vols., 1825–37), his most important work; *Geschichte der Teutschen* (3 vols., 1842–43). Consult Herrmann, *Die Geschichtsauffassung Ludens, etc.* (Gotha, 1904).

LUDENDORFF, GENERAL ERIC VON. See SUPPLEMENT.

LÜDENSCHEID, lṳ'den-shīt. An industrial town of Prussia, in Westphalia, in a mountainous district, 33 miles northeast of Cologne. It manufactures cutlery, hardware, articles of German silver and other alloys, musical instruments, buttons, buckles, hooks, match boxes, umbrellas, canes, and wire. Its iron foundries, machine shops, and cotton mills also give employment to many workers. Pop., 1900, 25,520; 1910, 32,301.

LÜDERITZ, lṳ'dẽr-ĭts, FRANZ ADOLF EDUARD (1834–86). A German merchant and founder of the first German colony in Southwest Africa. He was born in Bremen, where he engaged in the tobacco business with his father; traveled in America from 1854 till 1859; and after his father's death in 1878 succeeded to the management of the business. In 1881 he established a factory at Lagos, and in 1883 he acquired Angra Pequeña, which the next year was placed under German protection. He was drowned in the Orange River in October, 1886.

LUDERITZ BAY. See ANGRA PEQUEÑA.

LÜDERS, lṳ'dẽrs, ALEXANDER NIKOLAYEVITCH, COUNT (1790–1874). A Russian general, born in the Government of Podolia. He entered the army when he was a boy and for 50 years (1805–56) served actively, participating in 100 battles. He particularly distinguished himself in 1812, in 1831 at the capture of Warsaw, in the Caucasus (1844), at the defeat of the Hungarians near Schässburg (1849), and in the Crimean War. Appointed Governor of Poland in 1861, he was recalled after a year of severe rule, and was honored by the Czar with the title of Count.

LÜDERS, lṳ'dẽrs, HEINRICH (1869–). A German philologist and specialist in the archæology of India. He was born in Lübeck and was educated at Munich and Göttingen. From 1895 to 1899 he was keeper and librarian of the Indian Institute at Oxford; in 1903 he went to Rostock as assistant professor of comparative philology and Sanskrit; became full professor at Rostock in 1905; and was called to Kiel in 1908 and to Berlin in 1909. His works include: *Vyâsa Çikshâ* (1895), a prize monograph; *Die Sage von Ṛsyaśṛnga* (1897 and 1901); *Die Grantharecension des Mahâbhârata* (1901); *Die Jâtakas und die Epik* (1904); *Das Würfelspiel im alten Indien* (1907); *Bruchstücke Buddhistischer Dramen* (1911). Lüders became one of the editors of the *Grundriss der Indo-Arischen Philologie* (Strassburg, 1896 et seq.).

LUD'GATE. A former gate in the western part of the ancient wall of London, so called because it was once supposed to have been built by the British King Lud. The name is preserved in the thoroughfare called Ludgate Hill, in Ludgate Circus, and in the former debtors' prison, removed in the latter part of the eighteenth century.

LUDHIANA, lo͞od'hė-ä'nȧ. The capital of a district of the same name in the Jalandhar division, Punjab, British India, on the North Western Railway, 71 miles northwest of Ambala (Map: India, C 2). It stands on a navigable nullah, or stream, which joins the Sutlej from the east about 15 miles below the town. It has a considerable grain trade and is noted for its manufactures of chuddars or shawls of soft Rampur wool, its pashmina cloths, turbans, and scarfs, furniture, and carriages. Its chief features are the fort, the shrine of Abdul Kadir-i-Jalani, the Anglican church, the American Presbyterian mission, established since 1840, the medical and zenana mission, and the public gardens. The town was founded in 1480 by two princes of the house of Lodi. Over 30,000 of the inhabitants are Mohammedans. Pop., 1901, 48,649; 1911, 49,703.

LU'DI. See GAMES, ANCIENT.

LUDI COMPITALICII. See COMPITALIA.

LUDI MEGALENSES. See MEGALESIA.

LUD'INGTON. A city and the county seat of Mason Co., Mich., on Lake Michigan, 105 miles northwest of Grand Rapids, on the Pere Marquette and the Ludington and Northern railroads (Map: Michigan, C 5). It has regular communication by steamer with Chicago, Milwaukee, and other lake ports, and through freight connection by railroad ferry with Manitowoc, Wis., 61 miles across the lake. The manufactures of lumber and salt are the principal industries; but there are also extensive game-board, watch-case, and printers' supplies factories, and a large grain trade. The city is a beautiful summer resort, situated at the mouth of the Marquette River and in a lake region well known for its fishing, and has the grounds and cottage of the Epworth League training assembly, a students' military camp, established by the government, a Carnegie library, a fine courthouse, a United States Weather Bureau station, and a clubhouse and park. The water works are owned by the municipality. Pop., 1900, 7166; 1910, 9132; 1914 (U. S. est.), 9969.

LUDLOW, lŭd'lō. A municipal borough in Shropshire, England, at the confluence of the Corve and Teme, 25 miles south-southeast of Shrewsbury (Map: England, D 4). It is an old and very interesting town, and was once a royal residence, surrounded by walls, one of the seven gates of which still exists. The twelfth-century castle, a magnificent ruin, was one of the most important strongholds against the Welsh. Here Arthur, eldest son of Henry VII, celebrated his marriage with Catharine of Aragon, afterward the wife of Henry VIII; here, in 1634, Milton's mask of *Comus* was written and performed for the first time, and here Butler wrote *Hudibras*. Ludlow succumbed to sieges by King Stephen, the Lancastrians, and the Parliamentarians, and was dismantled in 1689. The collegiate church of St. Lawrence is remarkable for its fine pre-Reformation stained glass and its Perpendicular central tower. Ludlow contains many old half-timbered houses, and its grammar school, founded in 1282, is the third oldest in the Kingdom. Pop., 1901, 6373; 1911, 5926. Consult: Clive, *History of Ludlow* (London, 1841), and Wright, *History of Ludlow* (ib., 1851).

LUDLOW. A city in Kenton Co., Ky., on the Ohio River, just below Covington and opposite Cincinnati, Ohio, and on the Cincinnati, New Orleans, and Texas Pacific Railroad (Map: Kentucky, F 1). It is a residential and manufacturing city, having railroad repair shops and manufactures of sheet and metal ware, brass castings, and all kinds of foundry products. Pop., 1910, 4163.

LUDLOW. A town in Hampden Co., Mass., 7 miles northeast of Springfield, on the Chicopee River and on the Boston and Albany Railroad (Map: Massachusetts, C 4). Features of interest include the Hubbard Memorial Library, Stevens Memorial Institute, Ludlow Hospital, and the beautiful group of school buildings. There are manufactories of carpet yarns, hemp twines, and webbing and bagging. Pop., 1900, 3536; 1910, 4948.

LUDLOW, Edmund (c.1617–92). An English Parliamentarian and regicide. He was born at Maiden-Bradley, Wiltshire; was educated at Trinity College, Oxford, studied law at the Inner Temple, and joined the Parliamentary army under Essex. After the death of his father, in 1646, he entered Parliament for Wiltshire and obtained command of a regiment of cavalry. He was an ardent republican, advocated the establishment of a commonwealth, and supported the bill for the abolition of the House of Lords. He was one of the judges of Charles I. His independence rendered him obnoxious to Cromwell, who sent him after the death of Charles to Ireland in 1650 with a military command. When Cromwell assumed the authority of Protector, Ludlow protested against it, being in favor of a republic. Returning to England in 1655, he refused unqualified submission to Cromwell. Distrusted on account of this refusal, he was required to give security that he would not oppose the government, which being privately furnished by his brother Thomas, Ludlow retired into Essex, where he resided till Cromwell died. He then returned, was active in Parliament, and endeavored to restore the Commonwealth. On the restoration of Charles II, feeling himself insecure, he fled the country in 1660, landed at Dieppe, and then went to Switzerland, taking up his residence at Vevey. Wearied with exile, after the advent of William III he returned to England in 1689, but, being threatened with arrest for participating in the execution of Charles I he again fled to Vevey, where he died. He wrote valuable *Memoirs* in three volumes (1698–99; new ed., by C. H. Firth, London, 1894). Consult *A Just Defence of the Royal Martyr K. Charles I from the Many False and Malicious Aspersions in Ludlow's Memoirs, and Some Other Virulent Libels of that Kind*, published anonymously in London in 1699.

LUDLOW, Fitz Hugh (1836–70). An American author, born in Poughkeepsie, N. Y. In 1857 he published *The Hasheesh Eater*, which achieved immediate popularity. He next became known as a writer of stories and sketches, contributing freely to *Harper's Monthly* and other leading magazines; and, having made a Western tour, published an account of his experiences in *The Heart of the Continent* (1870). He also wrote *The Opium Habit* (1868), designed as a warning.

LUDLOW, James Meeker (1841–). An American Presbyterian clergyman, born at Elizabeth, N. J. He graduated at Princeton in 1861 and at Princeton Theological Seminary in 1864. Between 1865 and 1909, when he retired, he was pastor of the First Presbyterian Church, Albany; the Forty-eighth Street Collegiate Reformed (Dutch) Church, New York; the Westminster Church, Brooklyn; and the First Presbyterian Church, East Orange, N. J. He wrote: *Concentric Chart of History* (1881); *My Saint John* (1883); *The Captain of the Janizaries* (1886; 3d ed., 1893); *A King of Tyre* (1891); *That Angelic Woman* (1892); *The Age of the Crusades* (1896); *Deborah* (1901); *Incentives for Life* (1902); *Sir Raoul* (1903); *Jesse Ben David* (1907); *Judge West's Opinion* (1908); *The Discovery of Self* (1910); *Avanti!* (1912).

LUDLOW, Roger (1590–c.1668). An English colonial lawyer and administrator in America. He was born at Dinton, Baycliffe, Wiltshire; was educated at Balliol College, Oxford, and afterward studied law. He went to New England in 1630 and became one of the first settlers of Dorchester, Mass., selecting the site for the original plantation. For four years thereafter he was a magistrate in the Court of Assistants for Massachusetts Bay, part of the time representing the Colony as agent in London, and in 1634 was chosen Deputy Governor. In 1635 he was defeated by John Haynes (q.v.) for Governor of the Colony, and the pique at this defeat and dissatisfaction with his surroundings led him in the following year to join, with a company of his Dorchester neighbors, the migration led by Thomas Hooker (q.v.) into the lower Connecticut valley. He settled at Windsor, was one of the first commission of government, in January, 1639, was a member of the convention at Hartford called to formulate a constitution for the Connecticut towns, and is believed to have drafted the famous document known as the Fundamental Orders. In the following April he was elected Deputy Governor of Connecticut. In August he accompanied Capt. John Mason (q.v.) in his second expedition against the Pequots. On the election of Haynes, who had also removed from Massachusetts to Connecticut, to the office of Governor, Ludlow, who called him his evil genius, left Windsor and founded the town of Fairfield, but continued as Deputy Governor. From 1643 to 1645 he was a commissioner in the Congress of the United Colonies of New England. In 1646 he was appointed by the General Court to codify the laws of Connecticut. His codification (published at Cambridge, Mass., in 1672) was officially adopted in 1650, and was long known as Mr. Ludlow's Code. It won for him the title of the "Father of Connecticut Jurisprudence." In 1654, after being censured by the General Court at New Haven for influencing Fairfield to make an unauthorized attack upon the Manhadoes, he left the colony in disgust. Little is known about his career thereafter, but it seems certain that in 1654 he and his family became residents of Michan's Parish, in Dublin, Ireland, and that he was still living there as late as 1664, and perhaps three or four years later. Consult: Alexander Johnston, "The Genesis of a New England State," in *Johns Hopkins University Studies No. 11* (Baltimore, 1883); id., *Connecticut* (Boston, 1887), in the "American Commonwealths Series"; Taylor, *Roger Ludlow, the Colonial Lawmaker* (New York, 1900).

LUDLOW, William (1843–1901). An American soldier, born at Islip, Long Island, N. Y. He graduated at West Point in 1864, was commissioned a first lieutenant of engineers, and served under General Hooker in the Atlanta campaign as chief engineer of the Twentieth Army Corps, Army of the Cumberland. He was assistant engineer to General Sherman's army during the famous march to the sea and the subsequent operations in the Carolinas, and earned the brevets of major and lieutenant colonel. From 1872 to 1876 he was chief engineer of the Department of Dakota. He was promoted to be major in June, 1882; was chief engineer of the Philadelphia water department, by special permission of the government granted in a resolution of Congress, from 1883 to 1886; and from 1886 to 1888 was engineer commissioner of the District of Columbia. He had charge of the river, harbor, and lighthouse work on the Great Lakes from 1888 to 1893. From 1893 to 1896 he was military attaché to the United States Embassy at London. He was promoted to be lieutenant colonel of engineers in August, 1895; was president of the United States Nicaragua Canal Commission in the same year, and in 1897–98 had charge of the river and harbor work at New York City. In May, 1898, on the outbreak of the Spanish-American War, he was appointed brigadier general of volunteers. He distinguished himself in the Santiago campaign, was promoted to be major general of volunteers in September, 1898, was president for a time of the board appointed to organize the army sea transport service, and in December, 1898, was appointed military Governor of Havana. On May 1, 1900, he was relieved, having previously, however (in January), been promoted to be brigadier general in the regular army, the first engineer since the Civil War to receive a line brigadier generalship. He afterward inspected technical military institutions in France, Germany, and England, for the purpose of formulating plans for a United States Army War College.

LUDOLF, lo͞oʹdŏlf, Hiob (1624–1704). A distinguished German Orientalist. He was born at Erfurt and educated there and at Leyden. On leaving Leyden he traveled through Europe, and while in Rome learned Ethiopic from an Abyssinian, Gregorius by name, whom he met there. In 1654 he became tutor to the children of the Duke of Saxe-Gotha, and in 1675 chamberlain at Altenburg. In 1678 he went to Frankfort-on-the-Main, where he died in 1704. Ludolf was one of the first of European scholars to take up the scientific study of Ethiopic, and his researches form the starting point for the subsequent investigations of Ewald, Dillmann, and others. His chief works are: *Historia Æthiopica* (Frankfort, 1681); *Commentarius* and *Appendix* to the same (ib., 1691, 1694); *Relatio Nova de Hodierno Habessiniæ Statu* (ib., 1698); an Ethiopic-Latin lexicon (London, 1661; 2d ed., Frankfort, 1699) and grammar (2d ed., ib., 1702); and a grammar and a lexicon of the Amharic language (ib., 1698).

LUDOLPHIAN NUMBER. See Ceulen.

LUʹDUS LATRUNCULOʹRUM. See Latrunculi.

LUDWICH, lo͞otʹvĭk, Arthur (1840–). An eminent German classical scholar, born at Lyck. He studied at Königsberg, where, after two years as professor at Breslau, he accepted a chair in 1878. His most important works deal with the Homeric poems and questions relating to them. Among his writings are: *Scholia in Homeri Odysseam Auctiora* (1888); *Homeri Odyssea* (1889, 1891); *Homerica I–VII* (1893–96); *Die homerische Batrachomyomachia, etc.* (1896); *Die Homervulgate als voralexandrinisch erwiesen* (Leipzig, 1898); *Der Karer Pigres und sein Thierepos Batrachomyomachia* (1900); *Homeri Ilias* (1902–07); *Nonni Dionysiæa* (1909–11); *Musaios, Hero, und Leandros* (1912). He is the author also of many monographs on philological subjects.

LUDWIG, lo͞otʹvĭk. The German form of the name of several kings and dukes of Bavaria. See Louis.

LUDWIG, lo͞otʹvĭk, Alfred (1832–1912). A German philologist and Sanskrit scholar. He was born in Vienna, was educated there and at Berlin, and in 1860 became professor of comparative philology at Prague. His published works are marked by no small originality, and by independence of commonly accepted views both in general and Indian linguistics. They include: *Der Infinitiv im Veda* (1871); *Agglutination oder Adaption* (1873); *Die philosophischen und religiösen Anschauungen des Veda* (1875); *Der Rigveda* (6 vols., 1875–88), a translation, with commentary, which advances the theory, also held by Sayce, that many verb forms are mere adapted noun cases and not compounds of verb stem and pronominal suffix, the standard from the traditional side. The last work has been augmented by *Ueber die Kritik des Rigvedatextes* (1889) and *Ueber die Methode bei Interpretation des Rigveda* (1891). He also wrote on *Platons Apologie des Sokrates und Kriton* (1856; 6th ed., 1879). He resigned his professorship in 1901.

LUDWIG, Karl Friedrich Wilhelm (1816–95). A German physiologist, born at Witzenhausen, Hesse. He was educated at Erlangen and Marburg, became professor of comparative anatomy at Marburg in 1846, and was made professor of physiology at Leipzig in 1865. He also taught at Zurich and Vienna. The doctrine of vitalism was abandoned by physiologists largely as the result of his researches, and many of his contributions have formed essential elements in the structure of modern physiology, especially of circulation. Ludwig was the greatest teacher of physiology of the nineteenth century. His principal work is *Lehrbuch der Physiologie des Menschen* (1852–56). Consult Sir J. Burdon Sanderson, in *Proceedings of the Royal Society of London,* vol. lix, part ii (London, 1895–96).

LUDWIG, Otto (1813–65). A German dramatist, novelist, and critic. He was born at Eisfeld in Saxe-Meiningen. Obliged by ill health to give up music, which he had begun to study under Mendelssohn, he turned his attention to literature. He first established his reputation by two tragedies, *Der Erbförster* (1853) and *Die Makkabäer* (1854). The novel *Zwischen Himmel und Erde* (1857) and the village tale *Die Heiterethei* (1854) are works of great power. His *Shakespeare-Studien* (1871; enlarged ed., 1892) ranks high among critical works of its class. The best edition of his works is that edited by Paul Merker for the Goethe-Schiller Archiv (10 vols., Munich, 1912 et seq.). Consult: Adolf Stern, *Otto Ludwig, ein Dichtenleben* (Leipzig, 1891); *Selected Writings,* vol. iii (ib., 3d ed., 1907); August Sauer, *Otto Ludwig* (Prague, 1893); Richard Müller-Ems, *Otto Ludwigs Erzählungskunst* (Berlin, 1905), a dissertation.

LUDWIGSBURG, lo͞otʹvĭks-bụrk. A town of Württemberg, Germany, 9 miles north of Stuttgart. It was founded in 1704 by Duke

Eberhard Louis as a rival to Stuttgart and was later greatly enlarged by Duke Charles (Map: Germany, C 4). Ludwigsburg is the second royal residence. It has many fine public squares and promenades and a monument to Schiller. The royal castle has beautiful salons, a splendid picture gallery and gardens. The town is the chief military depot of Württemberg, with a cannon foundry, an arsenal, and a military academy. Among its manufactures are metal and iron wares, wire, organs, pianos, linen, cotton, and woolen goods. Pop., 1900, 19,359; 1910, 24,926.

LUDWIG'S (lo͞ot′vĭks) **CANAL.** See Danube.

LUDWIGSHAFEN, lo͞ot′vĭks-hä′fen. The chief industrial and commercial centre of the Rhine Palatinate, Bavaria, situated on the left bank of the Rhine opposite Mannheim, with which it is connected by a railway bridge. Extensive improvements were completed on its harbor in 1910. There is an excellent trade in coal, timber, and iron; and there are extensive manufactories. These include the largest chemical works in the world (Badische Anilin- und Sodafabrik) and manufactures of various acids, fertilizers, shoddy, vinegar, flour, spirits, wagons, machinery, bridge materials, cellulose, refrigerators, lumber, bricks, pottery, and woolen textiles. Prior to 1843 the place was only of strategic importance because it was opposite Mannheim. In that year the settlement was founded by King Louis I of Bavaria and in 1859 was made a city. Its population has been greatly increased by the annexation of adjacent places. Pop., 1900, 61,905; 1910, 83,301.

LUERSSEN, lụr′sen, Christian (1843–). A German botanist, born in Bremen. He studied at Jena and Leipzig and was made curator of the herbarium at Leipzig (1881), professor in the School of Forestry at Eberswalde (1884), and professor at Königsberg (1888). He retired in 1910. He specialized in the study of the vascular cryptogams and wrote: *Filices Græffeanæ, zur Kenntniss der Farnflora der Viti, Samoa, Tonga und Ellice Inseln* (1871); *Beiträge zur Entwicklungsgeschichte der Fransporangien* (1872); a valuable *Medizinisch-pharmazeutische Botanik* (1877–82); *Grundzüge der Botanik* (1877; 5th ed., 1893).

LUES, lū′ēz (Lat., plague). An old term, but still much employed as a synonym for syphilis (q.v.).

LUFFT, lụft, Hans (1495–1584). A German printer and publisher, commonly called "the Bible printer," because in 1534 he printed at Wittenberg the first complete edition of Luther's Bible, in two quarto volumes with illuminations in gold and colors by Lucas Cranach. Lufft printed in the 40 years following more than 100,000 copies of the German Bible. He also printed most of the other works of Luther. Consult the biography by Zeltner (Altdorf, 1727); also Von Dommer, *Die ältesten Drucke aus Marburg in Hessen, 1527–1566* (Marburg, 1892).

LUF′KIN. A city and the county seat of Angelina Co., Tex., 118 miles northeast of Houston, on the Houston, East and West Texas, the St. Louis Southwestern, the Eastern Texas, the Groveton, Lufkin, and Northern, and other railroads (Map: Texas, E 4). It contains a fine high-school building and, among its industrial establishments, large lumber mills, sheet-metal works, a wagon factory, foundry and machine shops, railroad shops and roundhouses, bottling works, a canning and preserving factory, etc. The city owns and operates its water works. Pop., 1900, 1527; 1910, 2749.

LUGANO, lo͞o-gä′nô. A town of the Canton of Ticino, Switzerland, on the northwest shore of Lake Lugano, 905 feet above sea level, 124 miles south-southeast of Lucerne (Map: Italy, B 1). The town is entirely Italian in character, with arcaded streets and broad promenades and squares along the lake front, while the shores of the lake, with their terraced vineyards and gardens, are dotted with villas. Most of the inhabitants speak Italian. The finest edifices of the town are the church of San Lorenzo with a marble façade, built in 1517 by Rodari, and the convent church of Santa Maria degli Angioli, containing the valuable fresco of "The Crucifixion" by Bernardino Luini. The view from Monte San Salvatore, whose summit (3000 feet) is reached by a cable railway, is particularly grand. It is the seat of a bishop. There are manufactures of vehicles, furniture, and chocolate, and a good trade in wine and silk. The yearly cattle market, held in October, is important. Pop., 1900, 9553; 1910, 13,262.

LUGANO, Lake of. One of the famous Italian lakes, situated between Lakes Como and Maggiore in the southern part of the Canton of Ticino, Switzerland, and partly extending into the Province of Como, Italy. Its length, following its windings, is about 20 miles; its width nowhere exceeds 1½ miles; its depth ranges from 950 feet in its upper part to 150 feet at its lower extremity, while between Melide and Maroggia it was so shallow that a stone dam was built across it for the St. Gotthard carriage and steam road. It receives a number of mountain streams, among them the Agno, and discharges through the Tresa into Lake Maggiore. The scenery along the shore is rugged and of exceeding beauty. The lake is provided with steamboats. Lugano is its principal town.

LUGANSK, lo͞o-gänsk′. A town in the Government of Ekaterinoslav, Russia, situated on the Lugan, a tributary of the Donetz, 240 miles east of Ekaterinoslav (Map: Russia, E 5). It has extensive iron foundries, engine works, one of which employs no less than 10,000 hands, and it also produces guns, agricultural and other machinery, beet sugar, tallow candles, leather, and brick. It is the seat of a meteorological station, a mineralogical museum with a library, and of the special administration of the government coal mines in the basin of the Donetz. Lugansk grew up around an iron foundry erected by the government in 1795. Pop., 1897, 20,400; 1912, 60,313.

LU′GARD, Sir Edward (1810–98). An English soldier. He was educated at the military college in Sandhurst, entered the British army as an ensign in 1828, and served many years with distinction in India. He was in the Afghan War of 1842, in the campaign on the Sutlej, in that of the Punjab, and in the Persian expedition of 1857, was made a G. C. B. in 1858, and was finally promoted to be lieutenant general and general. He was Undersecretary of State for War from 1861 to 1871 and in the latter year was appointed President of the Army Purchase Commission.

LUGARD, Sir Frederick (John Dealtry) (1858–). An English administrator and explorer. At the age of 20 he entered the army, and he received medals for his services in the

Afghan War (1879–80), the Sudan campaign (1884–85), and the Burma campaign (1886–87). In 1888 he commanded a volunteer force against the Lake Nyassa slave traders, and from 1889 to 1892 explored the Sabakhi and was administrator of Uganda for the British East Africa Company. He successfully opposed the British abandonment of Uganda. In 1894 he made commercial treaties opening Borgu to the Royal Niger Company, in 1896–97 led the British West Charterland Company's expedition to Lake Ngami, in 1897–99 commanded the West African frontier force, and in 1900 became Commissioner of Northern Nigeria, in which post he crushed the opposition of the Sultan of Sokota. He was Governor of Hongkong in 1907–12 and then became Governor and commander in chief of Nigeria. He was knighted in 1901. His *Rise of our East African Empire* (1893) and *Story of the Uganda Protectorate* (1900) describe his own activities in Africa.

LUGARD, Lady (Flora Louise Shaw) (?–). An English writer on colonial matters. She was the daughter of Maj. Gen. George Shaw of the Royal Artillery and in 1902 married Sir Frederick Lugard. As Miss Flora Shaw, she was head of the Colonial Department of the London *Times*, which sent her on special commissions to South Africa, Australia, Canada, and the Klondike; and she wrote *Castle Blair* (1878) and *Hector: A Story for Young People* (1883). Her *Tropical Dependency* (1905) is a valuable study of Nigeria.

LUGDU′NUM. The Latin name of Lyons.

LUGDUNUM BAT′AVO′RUM. The Latin name of Leyden.

LÜGENFELD, lụ′gen-fĕlt. See Field of Lies.

LUG′GAGE. See Baggage.

LUG′GER (probably from *lug*, sail, ear, from Swed., Norw. *lugga*, to pull by the forelock, from *lugg*, forelock, hair of the head). A small vessel, carrying two or three masts, with a lugsail (q.v.) on each and occasionally a topsail. The rigging is light and simple, and the form of the sails enables a lugger to beat close up to the wind. Among English boats the lug rig rarely extends beyond the larger class of fishing vessels, though there are some very elegant lugger yachts in the different clubs. In France, however, it is a favorite rig and is used for vessels of considerable size.

LUGO, lo͞o′gō. A town of central Italy, in the Province of Ravenna, 17 miles west of Ravenna (Map: Italy, C 2). It has an old castle, a public library, a Gymnasium, and a technical school. There is an important annual fair, which lasts from the 1st to the 13th of September. It manufactures rope and has trade in hemp, grain, cattle, silk, and wine. Pop. (commune), 1901, 27,415; 1911, 27,867.

LUGO, lo͞o′gō. A province of northwest Spain, formed (1833) by parts of the old Kingdom of Galicia (Map: Spain, B 1). Area, 3814 square miles. Pop., 1900, 465,386; 1910, 472,965. The Cantabrian Range runs through the northern and eastern sections of the province. Although some of the valleys are very fertile and produce considerable grain and fruit, agriculture is not earnestly developed. Strikes and lack of transportation facilities have hindered exploiting the good mines and quarries. Fishing and manufacturing form the chief industries.

LUGO (Lat. *Lucus Augusti*). The capital of the Province of Lugo, in the northwestern part of Spain, situated on the left bank of the Minho (Miño), 46 miles southeast of Coruña and on the railroad between that city and León (Map: Spain, B 1). The old city is surrounded by an ancient wall, partly of Roman origin. It is about 36 feet high and 20 feet wide and as late as 1809, when the French destroyed some of the fortifications, had 85 cylindrical towers; its top offers a magnificent promenade around the city. Lugo has a Romanesque cathedral of the twelfth century, to which so many later additions have been made that the Romanesque effect has been almost lost. There are manufactures of leather, linen goods, and cream of tartar. It was celebrated in the time of the Romans for its warm sulphur baths. Pop., 1900, 28,024; 1910, 35,726.

LUGOL'S SOLUTION. See Iodine.

LUGOS, lụ′gôsh. The capital of the County of Krassó-Szörény, Hungary, situated on the river Temes, 34 miles east-southeast of Temesvár by rail (Map: Hungary, H 4). It is divided by the river into German and Ruman Lugos, inhabited by Germans and Magyars respectively. In the vicinity are extensive vineyards, and wine is the principal article of trade. There are manufactures of lumber, linen, and silk. Several important fairs are held annually. Lugos is the seat of a Greek bishop and has a Gymnasium. It was formerly fortified. Here Kossuth and his allies made their last stand for Hungarian independence before fleeing to Turkey. Pop., 1900, 16,126; 1910, 19,818.

LUG′SAIL (from Swed., Norw. *lugga*, to pull by the forelock, from *lugg*, forelock, hair of the head). A sail in the shape of a quadrilateral, the head shorter than the foot and the luff shorter than the leech. The head is bent to a yard which is hoisted by halliards bent (i.e., made fast) about one-fourth or one-third the length from the forward end. The tack of the sail secures at the foot of the mast or a short distance forward of it. The lugsail is a very good one for open boats, as it gives spread of canvas with a low centre of pressure; but it is inconvenient in tacking, as the yard has to be lowered and hoisted on the other side of the mast (this is called dipping the lug), and in most lug rigs either the sheet or tack must also be dipped.

LUG′WORM. An English name for the lobworm (q.v.).

LUINI, lo͞o-ē′nē, Bernardino (c.1475–c.1533). A Milanese painter, of the high Renaissance. He was born at Luino, on Lake Maggiore, between 1475 and 1480, the son of Giovanni Lutero. His chief master was Borgognone (q.v.), with whom he labored in the decoration of the chapel of San Maurizio, Milan. The years between 1521 and 1530 he spent in decorating churches at Milan, Saronno, and Lugano. He was a follower of Leonardo da Vinci, though there is no record of his ever having personally known or studied under that master. The earliest work attributed to Luini, a "Pietà," in the choir of Santa Maria della Passione at Milan (1510), shows the influence of Borgognone; but his paintings between the years 1510 and 1520, including many of his easel paintings, are in Leonardo's style. After 1520, though retaining the principles of Leonardo as the basis of his work, his frescoes show greater independence of execution and more individual power. He died soon after 1533.

He chose his subjects from the Bible, sacred legends, and mythology. His portrayal, while tender and sympathetic, appealing to the emotions rather than the intellect, is accurate, the action good, and the coloring refined. His work is transitional, departing from the strength of the old masters and groping after the beauty of perfected Italian art. He worked in oil, tempera, and fresco, but is most famous as a fresco painter, and he especially excelled in church adornment.

His most important frescoes are: "The Crucifixion," in the church of Santa Maria degli Angeli at Lugano; "St. Catharine Borne by Angels," the "Madonna Enthroned between St. Anthony and St. Barbara" (1521), in the Brera Gallery, Milan; "Christ Crowned with Thorns," in the Ambrosiana, Milan; a series of frescoes in the choir of the church of Santa Maria at Saronno (1525), including a "Marriage of the Virgin" and the "Presentation in the Temple"; another series in the chapel of San Maurizio, Monastero Maggiore, Milan, and the decorations of Palazzo Litta, Milan, now in the Louvre. His easel paintings are especially numerous in the public and private collections of Milan. In the Brera are two late Madonnas, one with a rose hedge; in the Ambrosiana, "Tobias and the Angel." His best-known other works include: "Beheading of John the Baptist," in the Uffizi, Florence; "Modesty and Vanity," in the Sciarra Palace, Rome; "Jesus among the Doctors," in the National Gallery, London; "Birth of Christ," in the Berlin Museum; "Herodias," in the Louvre. Consult: Pierre Gauthier, "Notes sur Bernardino Luini," in *Gazette des Beaux-Arts*, vols. xxii-xxiii (Paris, 1899–1900); G. C. Williamson, "Bernardino Luini," in *Great Masters in Painting and Sculpture* (London, 1899); *Masters in Art*, vol. iii (Boston, 1902); James Mason, *Bernardino Luini* (New York, 1908).

LUINO, lo͞o-ē′nȯ. A town in the Province of Como, Italy, at the mouth of the Tresa, on the east shore of Lake Maggiore (q.v.) (Map: Switzerland, C 3). It markets grain, wine, and fruit, weaves cotton, spins silk, has several good hotels, and fine villas with ornamental gardens. Pop. (commune), 1901, 5890; 1911, 6870.

LUISE, lo͞o-ē′*ze*, AUGUSTE WILHELMINE AMALIE (1776–1810). Queen of Prussia and one of the noblest women in history. She was born at Hanover, where her father, Duke Karl of Mecklenburg-Strelitz, was Governor. She was married to the Crown Prince of Prussia, afterward Frederick William III, in 1793. After his accession to the throne (1797), she became exceedingly popular, her great beauty being united with dignity and grace of manners and with much gentleness of character and active benevolence. This popularity increased in consequence of her conduct during the period of national calamity which followed the battle of Jena, when she displayed a patriotic spirit, energy, and resolution. Just before Tilsit (q.v.) she visited Napoleon and sought in vain to win merciful terms for Prussia, and she brought her husband to favor Stein and Hardenberg. She died on a visit to her father in Strelitz. Her memory is cherished in Prussia, and the Order of Luise in that Kingdom was founded in honor of her. Consult: Mommsen and Von Treitschke, *Königin Luise* (Berlin, 1876); Hudson, *The Life and Times of Louisa, Queen of Prussia* (3d ed., London, 1877); Adami, *Luise, Königin von Preussen* (12th ed., Gütersloh, 1888). Her correspondence with King Frederick William III was published by Bailleu in 1903.

LUISE DOROTHEA, dō′rȯ-tā′ȧ (1710–67). A Duchess of Saxe-Gotha and Altenburg, of marked literary tastes. She was born at Coburg and after the death of her father, Ernst Ludwig I, in 1724, was educated by her stepmother, Elizabeth Charlotte, daughter of the Great Elector. In 1729 she married her cousin, the Crown Prince of Gotha, later Duke Frederick III; she bore him four children, of whom the third, August, was a friend and patron of Wieland, Herder, and Goethe. Luise was a wise political adviser of her husband, but took much more interest in literature and science and carried on a varied correspondence with French men of letters, especially Voltaire, Diderot, and D'Alembert, and also with Frederick the Great.

LUISEÑO, lo͞o′ē-sä′nyȯ. A small tribe of Mission Indians (q.v.), formerly attached to the mission of San Luis Rey, southern California.

LUISE VON GALL, lo͞o-ē′*ze* fȯn gȧl. The pseudonym of the wife of Levin Schücking (q.v.).

LUITPRAND, lo͞o′ĭt-pränt. See LIUTPRAND.

LUIZ, lo͞o-ēs′ *or* lo͞o-ēsh′. See LOUIS.

LUKÁCS, lṳ′käch, BÉLA VON (1847–1901). An Hungarian statesman, born at Zalatna. He studied law at Pest, was elected to the Diet in 1872, and in 1886 became director of the Hungarian State railways, in which capacity he introduced important reforms. In 1890 he was appointed a Secretary of Commerce and on the death of Baross, in 1892, became Minister of Commerce. In 1900 he was the Hungarian Commissioner to the Paris Exposition. He wrote a number of financial works, including a treatise on the *Financial and Tax System of Austria and Hungary* (1876); one on the *Austro-Hungarian Bank* (1882); and others on the financial administrations of Rumania, England, and France.

LUKASZEWICZ, lṳ′kȧ-shĕv′ĭch, JOZEF (1799–1873). A Polish historian, born at Kromplevo, near Posen, and educated at the Gymnasium of Posen. In 1829 he was appointed librarian of Count Raczynski. With Poplinski he formed a Polish press and publishing house and edited *Tygodnik Literacki*, *Przyjaciel ludu*, and *Oredownik*. In 1852, after teaching Latin several years in Posen, he bought the Targoszyce estate and resigned from his position as librarian. His works include a translation of Pliny's *Natural History* (1845); the Protestant histories: *Wiadomośc historyczna o Dyssydentach w miescie Poznaniu w XVI w XVII wieku* (1832; Ger. trans., 1843), on the history of dissent in Posen; a work on the Bohemian Brethren, *O Kościolach Braci Czeskich w dawnéj Polsce* (1835); and, on the Calvinist body in Lithuania, *Dzieje kośoiolów wyznania Helweokiego na Litwie* (1841–43); the Catholic ecclesiastical history, *Krótki opis historyczny kościolow parochialnych* (1858–63); a sketch of Posen, *Obraz historyczno-statystyczny miasta Poznania* (1839); a geography, written with the pseudonym J. Andryszowicz, *Geografia starozitnej Polski* (1842); and the valuable history of Polish education, *Historya szkól w Koronie i W. Ks. Lit.*, etc. (1849–51).

LUKE (Gk. *Λουκᾶς*, *Loukas*, probably contracted from *Λουκανός*, *Loucanos*). The author of the Third Gospel and the Book of Acts in the New Testament. He is mentioned but three times in the New Testament, each reference being in Paul's Epistles (Col. iv. 14; Philem. 24; 2 Tim. iv. 11). At this same time the critical certainty of his authorship of the Third Gospel and the Book of Acts gives us the so-called diary passages in the latter writing (xvi. 10–17; xx. 5–xxi. 18; xxvii. 1–xxviii. 16) as additional sources for our knowledge of his life and work in the early Church. The first passage shows us that he accompanied Paul when he sailed from Troas to Philippi on his second mission tour. From the second passage we learn that some six years later he was again with Paul at Philippi, from which place he journeyed with the Apostle to Jerusalem. The third passage shows him as Paul's companion on his voyage to Rome.

It may be that between the second and third mission tours Luke remained at Philippi, carrying on the work which Paul had begun at that place. This would be quite natural if Philippi was Luke's home (Renan), particularly if, as a Macedonian, he had met Paul in Troas, and it was he that Paul saw in his vision urging him to come over into that province (Ramsay), though early tradition, approved by Zahn and Harnack, makes him a native of Antioch. There is, however, abundant reference in the Acts narrative both to Antioch and to Macedonia, and the Antiochian references could be understood, without involving that place as Luke's home, if the tradition be accepted that Theophilus, to whom both his writings are dedicated, was a resident of that city.

As Luke accompanied Paul on his last journey to Jerusalem and sailed with him on his voyage to Rome, he may have been with him during his two years' imprisonment at Cæsarea. At Rome, during the Apostle's first captivity in that city, he assisted him in Christian work (cf. Philem. 24), and may have ministered to his bodily ills (cf. Col. iv. 14). He was also a faithful attendant on Paul in his second Roman imprisonment (Col. iv. 14), even when other friends had deserted him (2 Tim. iv. 11), though, apparently, he was at no time a prisoner with the Apostle, as were Aristarchus (Col. iv. 10) and Epaphras (Philem. 23). Later in life, after Paul's death, he wrote his Gospel, and afterward the Book of Acts, having in mind most likely a third writing, in which he planned either to give an account of Paul's work in Rome and his activity during the period between his release from his first imprisonment and his final arrest which issued in his martyrdom, or to tell in general of the further proclamation and spread of the Gospel in the Roman Empire from the new centre in the Imperial capital. As far as known, however, this third book was never written.

Luke was of Gentile extraction and a physician by profession. His works show him to have been a man of culture, and his faithfulness to Paul, with the latter's affectionate mention of him (Col. iv. 14), is evidence of a sincere, warmhearted spirit. For details as to Luke's writings, see LUKE, GOSPEL OF; ACTS OF THE APOSTLES. Consult, besides the commentaries on Luke, Theodor Zahn, *Introduction to the New Testament* (3 vols., Eng. trans., Edinburgh, 1909); Sir W. M. Ramsay, *St. Paul the Traveler and the Roman Citizen* (3d ed., New York, 1898); R. A. La Fontaine (ed.), *Four Evangelists in Classic Art* (ib., 1900); Adolf Harnack, *Luke the Physician* (ib., 1907); Sir W. M. Ramsay, *Luke the Physician and Other Studies* (ib., 1908); John Naylor, "Luke the Physician and Ancient Medicine," in *Hibbert Journal*, vol. viii (London, 1909); R. N. Willson, *Medical Men in the Time of Christ* (Philadelphia, 1910).

LUKE, GOSPEL OF. The third of the New Testament Gospels. It is peculiar in the amount and arrangement of its material, the reason for which is given in the prologue to the narrative (i. 1–4). In this prologue it is clearly stated that the author's purpose in writing the narrative was that its recipient, Theophilus, might know the certainty (*τὴν ἀσφάλειαν*) regarding the words (*λόγων*) in which he had been catechetically instructed (*κατηχήθης*). With a view to this he desired to write him an orderly record (*καθεξῆς*) of this history, having carefully followed it up from its beginning (*ἄνωθεν*), consulting, evidently, not merely such fragmentary accounts of it as had been variously prepared (verse 1), but also the primary witnesses to it and proclaimers of it on whose personal evidence these accounts rested (verse 2). His plan was, consequently, much more historical in its conception than that of Matthew or Mark and presents in its working out the naturally resulting characteristics which we should expect to find. Of the four Gospels its narrative is the most complete in its extent, beginning not merely with the annunciation of Jesus' birth (i. 26–38), as Matthew does, but with that of the birth of John the Baptist (i. 5–25), and ending with a passage which must be taken as the Evangelist's statement of the ascension (xxiv. 50–53). Within these limits this Gospel is also the fullest in the number of events which it records, almost one-third of all the sections contained in the Synoptic narrative being peculiar to it. This specialty of material is seen particularly in its account of what is commonly known as Jesus' Perean ministry (ix. 51–xix. 28). Though some of the items in this long section evidently belong elsewhere in the narrative, no other of the Gospels gives this portion of the history so fully as does this one, the larger part of these 10 chapters being peculiar to it.

In view of these facts the arrangement which the Evangelist has given his material is interesting. After the prologue there is a passage devoted to the prefatory history, containing the annunciation of the births of John the Baptist and of Jesus (i. 5–38), with the visit of Mary to Elizabeth (i. 39–56); the birth of John, with the prophetic song of Zacharias (i. 57–80); the birth of Jesus, preceded by the enrollment decree and followed by the visit of the shepherds (ii. 1–20); the circumcision and presentation in the Temple, with the prophetic song of Solomon (ii. 1–20); and the later visit of the boy Jesus to Jerusalem (ii. 41–52). The ministry of Jesus is then introduced by the preliminary narrative prefaced by a statement of the political situation at that time (iii. 1–2 a), and containing an account of the ministry and death of the Baptist (iii. 2 b–20), and the symbolic induction of Jesus into his work (iii. 21–iv. 13), in the midst of which is inserted the genealogical record (iii. 23–38). The public ministry of Jesus is divided, largely as in Mark, into two main portions. The first gives an account of Jesus' work among the people (iv. 14–ix. 17). Unlike Mark (q.v.), however, or even Matthew (q.v.), the scene of this work is wholly confined to Galilee, no account being given of the period of retirement in the region north of Galilee. This is then followed by the second portion, which is apparently intended by the Evangelist to describe Jesus' work of instruction, mainly among his disciples (ix. 18–xix. 28). The scene of this portion is unequally divided, a few verses being given to the instruction in the regions near to Galilee (ix. 18–50)—which thus, after all, attaches Luke's narrative geographically to Jesus' retirement in the north country, the larger part being given to the instruction during Jesus' so-called Perean ministry (ix. 51–xix. 28). Of these two portions the former, though so much smaller, contains that which is fundamental to the whole instruction, recording the disciples' confession at Cæsarea Philippi (ix. 18–21), the transfiguration (ix. 28–36), and the initial announcements by Jesus of his passion (ix. 22–27, 43–45); the latter is conspicuous for the parabolic element in it (see chaps. xii–xix). The ministry in Jerusalem (xix. 29–xxi. 38) gives the public entry into the city (xix. 29–48), the conflict with the leaders of the people (xx. 1–47), and Jesus' eschatological discourse (xxi. 1–36)—the narrative closing with the passion and the resurrection (xxii. 1–xxiv. 49). To this is added what was intended by the Evangelist to be a statement which is enlarged by him in the opening verses of the Book of Acts (i. 1–12).

As to the sources which Luke used in producing his narrative, it is recognized that his main source was the Gospel of Mark, substantially in the form in which we now have it. In fact, the greater part of Mark's contents is reproduced in Luke's record, in not a few cases being given where it is not found in Matthew's. It is also recognized that, in addition to Mark, Luke made use of other sources, two of which may be called major sources, as they account for a considerable part of his record where it differs from Mark. Of these two, the more important one is inserted in two solid sections—one extending from ix. 51 to xviii. 14, and the other from xix. 1 to xix. 28. This source is known as the Perean Document, since it gives, generally speaking, the extra Jerusalem ministry of Jesus after he left Galilee and before he went to the last Passover—a ministry covered not merely by his journey from Galilee to Jerusalem at the Feast of Tabernacles (John vii), but by his several retirements from Jerusalem between the September of that feast and the April of the final Passover (cf., e.g., John x. 40–42; xi. 54) and carried on in Judæa and beyond the Jordan. The other of these two major sources Luke has inserted at various places in his earlier narrative, from chap. iii to chap. viii—displacing the parallel records of Mark. This is known as the Galilean Document, as it is confined to incidents in Jesus' ministry in that region. Besides these major sources, which were unquestionably written, Luke made use of minor sources, which may or may not have been written, and disclose themselves in his story of the nativity and infancy (chaps. i and ii) and in his record of the passion and resurrection (chaps. xxii–xxiv). Whether he made use of Matthew, in its present form, or of the Logian sources of Matthew is a matter of critical debate; but it is characteristic of him that, while he freely alters the Markan record in the interest of better literary form, he reproduces at least his written sources in the form in which he found them, even where that form involves unchronological situations (e.g., in placing in his Galilean Document Jesus' visit to Nazareth at the beginning of his Galilean ministry, chap. iv, and in the inclusion in his Perean Document of various incidents which must have occurred earlier in Jesus' work). On the whole, his work is done not only with an historical aim in view but in a literary spirit. This is clear from his constant tendency to enrich the narrative rhetorically, his ability to do which is evident from the literary character of his prologue. At the same time no other Evangelist uses such striking Hebraisms and uses them so conspicuously as this one. The combination of these two elements gives a versatility to his style which is not possessed by any other of the Evangelists. A marked example of this quality of style is seen in the sharp change from the classical prologue (i. 1–4) to the Hebraistic narrative of the nativity (i. 5–ii. 52). That this Hebraism comes from the linguistic character of the sources used may be granted; but the author's willingness to use it, as he does, in the narrative of purely Hebrew events (note the difference in the linguistic character of the story of the Jerusalem Church and the record of Paul's travels in the Book of Acts, and notice that the Hebrew element is practically nearly absent from the Palestinian narrative which the Gospel gives) shows on his part a certain literary conception of what was proper in the treatment of the different lines his narrative pursued.

From the evident literary character of the author's writings it is most natural to infer that he was a Gentile Christian of Greek culture. This is questioned, indeed, by only a few scholars. At the same time, from a survey of its theological views, as well as its vocabulary and its phraseology, it is plain that the author is of a strikingly Pauline cast of mind, the only question practically being as to the degree of his Paulinity. Unlike the other Gospels, this one names the reader for whom it was intended—a certain Theophilus (i. 3). From the term used in addressing him (*κράτιστε*), he was evidently a man of rank; while, from the general Gentile tenor of the narrative—especially the evident ignorance regarding Palestinian geography and Jewish customs which it implies on its reader's part—he was clearly a Gentile Christian. The Gospel gives no hint of Theophilus' residence, though such tradition as exists makes it Antioch. The author's motive is clearly given in the prologue—that Theophilus might have certain knowledge of the words regarding which he had been instructed (i. 4). From this it is evident that the reader, who was either a convert or well advanced towards an acceptance of Christianity, stands as a type of the general class for which the Gospels were written. They had been instructed orally and largely on religious if not doctrinal lines, as candidates for baptism (note the significant use of the word *κατηχήθης*, in i. 4), the historical background not having been prominent, to say nothing of complete. To such, especially if gathered from paganism, it became a matter of interest and of importance to know the full history which stood behind the salvation which had been taught them. See ACTS OF THE APOSTLES.

As to the time of this Gospel's writing, there is an absence of the features which in Mark seem to indicate a date previous to the destruction of Jerusalem (70 A.D.). On the other hand, the military terms in such passages as xix. 41–44 and xxi. 20–24 (terms peculiar to this Gospel) would readily agree with the event having taken place when the author wrote; while the announcement of the Second Advent does not seem to be connected so much with this definite catastrophe as with the indefinite future of the times of the Gentiles being fulfilled (cf. xxi.

24–28 as compared with Mark xiii. 19–27; though, on the other side, we cannot but notice in Mark xiii. 10–12 far-reaching future statements to which Luke has no parallel). On the whole, the most likely date is between 70 and 80; though Harnack (*Date of Acts*, pp. 116–133) argues strongly for a date preceding 70—in fact, for a date within the lifetime of Paul, in which period he places the composition of Acts also. In this early dating of the Gospel he is followed by such other scholars of recent years as Resch and Blass.

In the internal evidence there is nothing which would render impossible an authorship by Luke, the companion of Paul. In fact, such conclusion is the general, though not the unanimous, opinion of criticism. Patristic evidence, moreover, is very clear, summing itself up into a witness to the existence of the book as far back as the last decade of the first century. According to the common literary custom of the first century, the name of the author must have been originally prefixed to the dedication of the book (i. 1–4). From this place it evidently was transferred to the title of the book as the book came to be accepted into the canon. The only title ever attached to the book, however, points to the name of the author as Luke.

Professor Blass, of Halle, has carried out in application to this Gospel his suggestion originally made regarding the two text forms of the Book of Acts; only, in the case of the Gospel, the shorter text is represented in that of the Codex Bezæ (D), the longer in that of the New Testament.

Bibliography. Besides the usual New Testament introductions and the special Synoptic works referred to in the literature cited under MATTHEW, GOSPEL OF, consult, for commentaries, those by Alexander MacLaren (New York, 1894); W. F. Adeney (Oxford, 1901); "St. Luke," in the *Modern Reader's Bible*, edited by R. G. Moulton (New York, 1907); Alfred Plummer (5th ed., ib., 1902). For general criticism: W. K. Hobart, *Medical Language of St. Luke* (London, 1882); J. J. Halcombe, *Gospel Difficulties, or the Displaced Section in Luke* (ib., 1888); Bakhuyzen, *Dogmatisch Karakter dat van het Evangelie van Lucas wordt teegekend* (Amsterdam, 1888); Paul Feine, *Vorkanonische Ueberlieferung des Lukas in Evangelium und Apostelgeschichte* (Gotha, 1891); M. Krenkel, *Josephus und Lukas* (Leipzig, 1894); T. D. Bernard, *Songs of the Holy Nativity* (London, 1895); Alfred Resch, *Das Kindheitsevangelium nach Lucas und Matthäus* (Leipzig, 1896); F. W. Blass, *Evangelium Secundum Lukum* (ib., 1897); id., *Philology of the Gospels* (Eng. trans., London, 1898); Sir W. M. Ramsay, *Was Christ Born in Bethlehem?* (New York, 1898); Theodor Vogel, *Zur Charakteristik des Lukas nach Sprache und Stil* (Leipzig, 1899); A. Wright, *Gospel According to Luke in Greek* (London, 1900); Adolf Harnack, *Luke the Physician* (New York, 1907); B. Weiss, *Quellen des Lukas Evangelium* (Stuttgart, 1907); Sir W. M. Ramsay, *Luke the Physician and Other Studies* (New York, 1908); Adolf Harnack, *Date of Acts and the Synoptic Gospels* (Eng. trans., London, 1911); MacLachlan, *St. Luke, Evangelist and Historian* (ib., 1912).

LUKE′MAN, HENRY AUGUSTUS (1870–). An American sculptor. He was born at Richmond, Va., and studied under Launt Thompson and Daniel Chester French in New York and at the Beaux-Arts in Paris under Falguière. Lukeman aided French in his statue "The Republic" at the Chicago Exposition and later acted as his assistant in New York. His independent works include monuments, portrait busts and statues, bas reliefs, and ornamental sculpture. They are architecturally effective and often remarkable in conception, as, e.g., in "Manu, the Law Giver of India," on the Appellate Court Building, New York. His portrait statues include those of William McKinley (Adams, Mass.); Robert Livingston (St. Louis); Professor Joseph Henry (Princeton University); "Kit Carson," an equestrian statue (Trinidad, Colo.). For the St. Louis Exposition (1904) he modeled the group "Music" (Festival Hall) and decorative sculpture (Electrical Building). Among his other works are four colossal statues for the Royal Bank, Montreal; four figures for the Brooklyn Institute; and the Soldiers' Monument at Somerville, Mass.

LUKE OF PRAGUE (c.1460–1528). A bishop of the Bohemian Brethren. He was born in Bohemia, studied at Prague, visited Constantinople and the East to see if there were primitive Christians there (1491), and Italy and France to confer with the Waldenses (1497–99). He was chosen Bishop in 1500. The Bohemian Brethren had in him a stanch and wise defender. He improved their ritual, prepared their catechism and hymn book (1505)—certainly among the earliest publications of the kind—wrote against their critics, and brought them into contact with the German reformers (1522 and 1524). He was called in his time the Antipope. In all he wrote some 80 volumes in Latin and Bohemian.

LUKE SHARP. A nom de plume of Robert Barr (q.v.).

LULE, lōō′lȧ. A tribe or confederacy with several subtribes, apparently constituting a distinct stock, formerly roving over the Chaco region of northern Argentina. In 1690 the Jesuit Barcena wrote a grammar of the language which he called the *Tonicote*, after one of their subtribes. Another grammar of the language was published by the missionary Machoni in 1732. They are now extinct, the nearest representatives of the ancient tribe appearing to be the Vilela, on the Vermejo River, in extreme northeastern Argentina. Consult: Lafone-Quevedo, in *Instituto Geografico Argentina, Boletin*, vol. xvi (Buenos Aires, 1895); D. G. Brinton, *Linguistic Cartography of the Chaco Region* (Philadelphia, 1898); Huonder, in *Globus*, vol. lxxxi (Brunswick, 1902).

LULEÅ, lōō′lĕ-ạ. A port of Sweden, situated on the Gulf of Bothnia at the mouth of the Lule-Elf (Map: Sweden, G 4). It is the seat of the Governor of the Län of Norrbotten and also of a bishop. After the fire in 1887 it was rebuilt on a regular plan with straight streets. Since it became a railroad terminus, in 1889, it has grown rapidly in importance, being the chief export town for Gellivara iron ore. Other exports are lumber, tar, reindeer, skins, and salmon. A steamship line runs to Stockholm. Luleå was founded by Gustavus Adolphus, some 7 miles farther up the Lule-Elf, but was transferred to its present site in 1649. Pop., 1901, 9484; 1912, 9021.

LULL, RAMON. See LULLY, RAYMOND.

LULLY, lŭl′lĭ, or **LULLI,** JEAN BAPTISTE (1633–87). A celebrated composer, and the founder of the French opera. He was born at

Florence, the son of a miller, and displaying, while still a child, a remarkable natural gift for music, he was educated by a monk in the use of the guitar. At the age of 14 he went to Paris and found employment as scullion in the household of the Princess de Montpensier. He, however, taught himself to play the violin and was placed among the 24 violinists attached to the service of the King. He soon undertook composition and so successfully that the King, having heard him perform his own pieces, made him the leader of a new band called "les petits violons." He was subsequently appointed superintendent of court music and finally placed at the head of the Académie Royale de Musique, which the King founded in 1669, and was made one of the King's secretaries. He composed 19 operas, besides ballet music and miscellaneous pieces, and even such composers as Handel and Purcell have not hesitated to acknowledge their obligations to him. He was on terms of intimacy with Molière, composed music for some of his pieces, and even acted with success in his comedies. He gave to his adopted country the fundamental principle of what has since come to be recognized as the French school of opera and introduced simplicity and directness of expression. Up to 1778 Lully's operas continued to hold the public favor; but after Gluck, Piccini, and Paisiello came into fashion he was heard no more. *Alceste* (1674), *Thésée* (1675), *Persée* (1682), and *Armide* (1686) are his most important compositions. He died in Paris. Consult Henry Prunières, *Lully* (Paris, 1909), and Lionel de la Laurencie, *Lully* (ib., 1911).

LUL′LY, Raymond (Raimundo Lullo, Ramon Lull) (c.1235–1315). One of the remarkable men of the thirteenth century and a pioneer in Europe in the study of the Arabic language and Mohammedanism. He was born at Palma on the island of Majorca, of good family, about 1235. In his youth he led a dissolute life as courtier and soldier. But about 1266 he withdrew to solitude and for five years led the hermit's life. The sudden change produced a fervid and enthusiastic state of mind, under the influence of which Lully formed the project of a spiritual crusade for the conversion of the Mussulmans, an idea he never afterward abandoned. In 1272 he entered the Third Order of St. Francis, and two or three years later persuaded King James of Aragon to found a monastery in Majorca to train missionaries for his project. In pursuance of this plan he studied theology, philosophy, and the Arabic language. The better to prosecute his studies, he betook himself to Paris, and received his degree there in 1288. He returned to Spain, where he taught and strove to enlist popes and princes in his enterprise. His success was not great, and at the end of 1291 or beginning of 1292 he went to Tunis to carry on his work single-handed. He drew large crowds of attentive hearers and held disputations with learned Mohammedans, who, however, were as anxious to convert him as he to convert them, and the result was that little impression was made by either of the parties. Finally, however, Lully was thrown into prison and expelled from the country. After lecturing at Naples for several years, he proceeded to Rome; thence to his native island of Majorca, where he labored for the conversion of the Mohammedans and Jews; thence to Cyprus and Armenia, zealously exerting himself to bring back the different schismatic parties of the Oriental Church to orthodoxy. In 1306–07 he again undertook to prove the truth of Christianity to the Mussulmans of Africa and was again expelled. He subsequently went to Paris and lectured against the principles of Averroës. His appeals to the Pope were not altogether fruitless, inasmuch as he induced Clement V to provide for instruction in Oriental languages at Rome, Paris, Oxford, Bologna, and Salamanca. In 1315 Lully undertook a third mission to Africa. Eager for martyrdom, he threatened the people with divine judgment if they refused to abjure Mohammedanism. At Tunis he was dragged out of the city, stoned, and died of his wounds on a vessel at sea near the island of Cabrera, June 30, 1315. His body was carried to Majorca, a fine tomb was erected, and stories of miracles have gathered about it. Lully's system of logic, to the elaboration and dissemination of which he gave much time and labor, professed to aid the mind in the acquisition and retention of knowledge by systematic arrangement of subjects and ideas and a fantastic scheme of mechanical help. It is set forth in his *Ars Magna.* Since he held that theology and philosophy are one science, so that the highest truths may be proved by human reason, the Catholic church has always regarded him as somewhat heretical. He wrote a great number of treatises, theological and philosophical. His reported achievements, which gained him the title of *doctor illuminatus*, are no doubt exaggerated, but he made certain real and valuable discoveries. His style is involved, figurative, and obscure. An incomplete and uncritical edition of his works, begun by Salzinger, appeared in eight volumes (Mainz, 1721–42). A new edition has been undertaken by Rossolló (Palma, 1886 et seq.).

Bibliography. For his life consult A. Helfferich, *Raymund Lull und die Anfänge der catalonischen Litteratur* (Berlin, 1858), and Wilhelm Brambach, *Des Raymund Lulls Leben und Werke* (Karlsruhe, 1893); also: Karl Prantl, *Geschichte der Logik*, vol. iii (Leipzig, 1867); Stöckl, *Geschichte der Philosophie* (Mainz, 1875); Marcelino Menéndez y Pelayo, *Historia de los heterodoxos* (Madrid, 1880); S. M. Zwemer, *Raymond Lully, First Missionary to the Moslems* (New York, 1902); F. L. Frost, *The Art de Contemplacio of Ramon Lull*, with an *Introduction and a Study of the Language of the Author* (Baltimore, 1903); R. E. Speer, *Some Great Leaders in the World Movement* (New York, 1911); J. H. Probst, *La mystique de Ramon Lull et l'art de contemplacio; étude philosophique suivie de la publication du texte catalan* (Münster, 1914).

LULONGO, lo͞o-lŏŋ′gō. A tributary of the Congo. It rises in the north-central part of the Belgian Congo and flows in a westerly direction, joining the Congo at Lulongo (Map: Congo, C 2).

LUMACHELLE, lụ′mȧ′shĕl′ (from It. *lumachella*, dim. of *lumaca*, snail, from Lat. *limax*, snail). A dark-brown shell marble with a brilliant firelike or chatoyant internal reflection that comes from the shells occluded in it. The best-known varieties come from Bleiberg, Austria, and from Astrakhan, Russia.

LUMBA′GO (Lat., disease or weakness of the loins). A very common and painful rheumatic affection of the muscles of the loins and their tendinous attachments. It comes on suddenly and in very severe cases completely incapacitates the patient, who may be unable to turn in bed or to rise from the sitting position. It is caused generally by conditions favorable to the development of rheumatism, such as cold and exposure. It may follow exposure to a draft of air. Men, especially laborers, and those of a rheumatic or gouty habit, are more prone to this affection. One attack renders the sufferer more liable to others. The affection may become subacute or even chronic. The pain is often very severe; it may be a dull ache, but is usually sharp and cramplike. It may be constant, or may occur only when the muscles are contracted by an effort to move. The affection may last for a few hours, or it may be prolonged for several weeks. Pressure on the affected part usually gives relief. In the treatment of lumbago rest is of the first importance. In acute cases aspirin, acetanilid, and the salicylate of soda in large doses relieve the pain. Acupuncture (q.v.) is a very efficient means of relief, but now rarely practiced. Sterilized needles, from 3 to 4 inches in length, are thrust into the lumbar muscles at the seat of the pain and withdrawn after five or ten minutes; in many instances this treatment gives immediate relief. The constant galvanic current is sometimes very beneficial. The static spark and high-frequency currents are even more efficacious. The thermocautery, hot fomentations, a Turkish bath, and, in obstinate cases, a blister may be employed. In chronic cases iodide of potash, guaiacum, and sulphur may be used. Those subject to lumbago should be warmly clothed and should, if possible, avoid cold and dampness. Consult Osler, *Practice of Medicine* (New York, 1912).

LUM′BAR PUNCTURE. A surgical procedure employed to induce spinal anæsthesia and for the diagnosis and treatment of certain diseases. The lumbar region is selected on account of its comparative safety and the slight danger of wounding the spinal cord, which here terminates the cauda equina; but any portion of the canal can be tapped. In performing lumbar puncture a point is selected at the level of the iliac crests, and a hollow needle or trochar is thrust in through the intravertebral space, either from the side or in the mid line. The stylet filling the needle is then withdrawn, and a small amount of spinal fluid allowed to flow out in order to ascertain if the needle is in the correct position. Examination of the fluid is of diagnostic importance in meningitis particularly. By this means it is possible to differentiate between the purulent, epidemic cerebrospinal and tuberculous forms of meningitis. Tapping the spinal canal gives great relief where there is intracranial pressure, as, e.g., in tuberculous meningitis. Tetanus has been cured by the injection of magnesium sulphate and antitoxic serum. Syphilis of the nervous system is treated by the injection of salvarsanized serum. For a full description of the technique, see SPINAL ANÆSTHESIA; see also ANÆSTHETIC and MENINGITIS.

LUMBER INDUSTRY (probably connected with Swed. *lomra*, to resound, from dial. Swed. *ljumm*, Icel. *hljōmr*, sound, Goth. *hliuma*, hearing; so called as being "lumbering" things). The production and manufacture of timber for building purposes (boards, planks, joists, shingles, etc.), telegraph poles, timber for shipbuilding, railroad ties, pulp wood, paving blocks, wood for furniture manufacture and cabinetwork, form one of the most extensive and important industries of the world. The United States, British America, Russia, Austria-Hungary, Sweden, Germany, and France are the chief lumber-producing countries, though tropical states and colonies furnish many beautiful varieties of timber, such as mahogany, ebony, and rosewood, which are chiefly used in furniture making.

With the decreasing lumber supply, growing demands, increasing prices, and the development of better methods of manufacture and transportation, new varieties of wood have become available for industrial use, areas previously cut over for the best species have been recut for species formerly believed to be valueless, and it has become possible to draw upon distant countries. In this way woods eminently suited for particular purposes have been obtained, and the supply and distribution of timber are becoming increasingly a world question.

The use of substitutes for wood is an economic factor of increasing importance to the lumber industry. Of these, building materials such as steel, stone, brick, and cement are probably most important. Building regulations and the desire for permanency are gradually displacing wood as a building material. Steel has replaced wood almost entirely in the construction of sea-going ships; the railroads of the United States are replacing wooden with steel cars. On the other hand, new uses have, on the whole, increased the demand for wood products, one of the most important of which is the use of wood pulp for paper making.

LUMBER TRADE OF THE UNITED STATES

Timber Supply. The most comprehensive estimate of the standing timber in the United States was reported in 1913 as follows by the Bureau of Corporations in *The Lumber Industry:*

	Billion feet B. M.
Privately owned timber:	
Pacific Northwest	1013
Southern pine region	634
Lake States	100
Other areas	450
Owned by the Federal government:	
National forests	*600
Owned by the Federal government, States, and on Indian reservations	90
	2887

* Includes Alaska.

The most striking fact about the distribution of the remaining timber supply is that more than 50 per cent is in the Pacific Northwest. The passage to private ownership of the vast amounts mentioned has occurred chiefly through Federal land grants for railroads, wagon roads, canals, river improvements, and other purposes; the cash-sales law; the script and warrant acts; the preëmption and homestead laws; and the timber and stone law.

The total area of forest land in the United States is estimated by the Forest Service at 545,000,000 acres. Of this amount, it is estimated, however, that only 450,000,000 acres will remain as permanent forest land.

History. In earlier days an important part of the lumber trade of the United States was the getting out of long timbers to be used as masts and spars, which industry first centred in Maine and later in Oregon and Washington. Since the introduction, in 1860, of the process of making paper from wood pulp, the production of pulp wood has attained great importance. For many years wood was, and in many rural sections still is, the principal fuel; but the chief demand for wood is for lumber, which is largely used for widely divergent construction and building purposes—practically all conifers in the United States and most hardwoods contributing to this purpose, the former to a much greater extent than the latter.

The industry as a whole first centred in New England, later in New York, then in Pennsylvania. The white pine of the Lake States was the dominant factor in the lumber trade for many years; but its place has now been taken by the Southern pine, and eventually the Pacific Northwest will become the great timber-producing region of the United States. In fact, the cut of saw timber in Washington for 1913 of 4,592,053,000 board feet is the largest ever recorded for any State, the nearest approach being that of 4,311,240,000 board feet reported for Michigan in 1890. It is probable that the production of Southern yellow pine has already reached its crest and will gradually fall off, but the production of the Pacific Northwest is rapidly increasing.

Methods. The lumber industry consists of three branches, which are defined in the sections on the lumber industry of the twelfth United States census as follows: 1. The logging industry, including the felling of timber, cutting it into lengths, and transporting it by rail, river, or otherwise to the mill. This industry is carried on largely by saw-mill owners or operators. The raw material of this industry consists of standing timber; the finished product consists of logs delivered at the mill. 2. The saw-mill industry, in which the raw material consists of saw logs and the product of rough lumber, including beams, joists, scantlings, boards, shingles, laths, etc. 3. The planing-mill industry, in which the raw material consists of rough lumber and the finished product of planed, with such minor manufactures as are carried on in connection with these mills. Some of the planing mills are operated in connection with saw mills, as a part of their operations, while others are under separate ownership and management. The thirteenth United States census (1910) includes also packing-box factories. During the last half of the nineteenth century great improvements were introduced in all three branches of this industry.

The modern lumber camp is as completely organized as the modern factory. Methods of logging vary considerably in different sections of the United States. Operations in the Northeast are characterized by snow logging. Logs are cut from late summer into early winter, skidded at once to specially prepared or iced roads on which they are sleigh-hauled in winter to a drivable stream or lake. They are "driven" to the mill during spring freshets. Animal power is used in skidding and hauling because of the small size and light weight of the logs, except in a few cases of long hauls, where steam log haulers are employed. Logging railroads are little used in the East, because of the light stands of timber, rough topography, and the presence of drivable streams.

The topography of the Southern forests is well adapted to cheap railroad construction. There are few drivable streams, and because of the weight of the timber the loss in driving is often as great as 25 or 35 per cent, and the snowfall is too light for sleigh hauling. Operations are continued throughout the year, except in the lowlands during wet periods. Both animals and power are employed—the former in the lighter stands, smaller timber, and rougher country, and the latter in the level pine lands and cypress swamps. In horse logging operations logs are often hauled to the railroad on big wheels. In power logging operations the same machine is used for skidding to the railroad and loading on the cars. The tract to be logged is as nearly as practicable gridironed with tracks so that the hauling and skidding distances will be short.

In the Appalachians year-long logging is common. Skidding is largely by animals, slides or chutes being commonly used, and transportation to the mill is by railroad driving or on trucks hauled by animals.

Railroad operations are conducted throughout the year in the Lake States unless suspended by snow. Sleigh hauling is customary. Skidding is almost entirely by animal power, and loading is commonly by steam. Driving is much less frequent than in early days, when it was the usual method of transportation to the mill.

Operations in the Rocky Mountains are ordinarily confined to the summer months. Animal power is used in skidding and hauling to the railroad, flume, or stream which is depended upon for transportation to the mill. Truck hauling to the mill is customary in the case of the small portable mills frequently found in this region.

Power logging has been most highly developed in the Pacific Northwest and is used exclusively in large timber. It has entirely replaced the picturesque, many-yoked ox teams of earlier days. The size and power of the donkey engines used in moving the logs are being gradually increased. Overhead systems are being slowly introduced, and electrical power is being tested. Railroad hauling, except where construction costs are excessive, has ordinarily been found more satisfactory than driving. Big-timber logging is highly specialized throughout. Because of the difficult problems encountered, the new science of logging engineering is being more rapidly developed in the Northwest than in any other section of the United States.

Flumes are used to a limited extent in every region for the transportation of sawed lumber, smaller materials such as railroad ties, mining timbers, cordwood, and even of saw logs. Rafting is not uncommon on the larger streams and is frequent on the lakes in timber regions. Ocean rafting is common in the Northwest. In practically all regions driving, which was first employed, has been replaced by railroad transportation. Methods used in logging pulp and other materials than saw timber are similar to, and in some cases identical with, those employed for saw timber.

In saw-mill machinery many changes were introduced during the last century. The primitive frame or pit saw was superseded by the circular saw, which was invented in England in 1777, but did not come into use in America till many years later.

The first insertible teeth for this saw were invented by W. Kendall, an American, in 1826. Gang saws, which had been known in Europe since the sixteenth century, kept pace with the rotary saws in their introduction into American forests. The band saw, the perfection of saw-mill machinery, though invented in England in 1808 and patented soon afterward in America, did not come into operation till 1872, when it was first used for cutting hardwoods in the Maumee valley of Ohio. Other improvements in saw-mill machinery are the direct steam feed, the steam nigger, or log-turning device, endless chains for bringing the logs into the mill, and mechanical carriers for lumber and for refuse. In addition to these there are the shingle, lath, and slab saws, which last, by using up inferior materials, reduce the amount of refuse.

Saw-mill plants vary greatly in size and output, from the portable plants with a capacity of from 5000 to 10,000 feet B. M. per day to the immense stationary plants characteristic of the Lake States, the Southern pine region, and the Pacific Northwest with a capacity of 150,000 to 500,000 B. M. per single shift. Portable mills and many of the small stationary mills are still equipped with circular saws, while the large stationary plants have band saws, gangs, edgers, and trimmers which greatly increase capacity and reduce waste.

Statistics. One of the most striking facts shown in Table I, of lumber and timber products, is the probable crest of timber production in the United States reached in 1909.

TABLE I. PRODUCTION OF LUMBER AND LUMBER PRODUCTS IN THE UNITED STATES

KINDS	1880	1890	1900	1905	1909	1910	1911	1912
Lumber . . . M feet B. M.	18,087,356	23,494,853	33,464,850	30,502,961	44,509,761	40,018,282	37,003,207	39,158,414
Lath . . . . M			2,523,998	3,111,157	3,703,195	3,494,718	2,971,110	2,719,163
Shingles . . . . M			12,102,017	15,340,909	14,907,371	12,976,362	12,113,867	12,037,685
Veneer . . . . M feet B. M.				181,146	435,981	477,479	444,886	
Poles . . . . no. purch'd			936,713	2,080,482	3,738,740	3,870,694	3,418,020	
Ties . . . . " "			22,524,640	77,981,227	123,751,000	148,231,000	135,053,000	
Round mining timber . . . cubic feet				165,535,900				
Firewood . . . . cords	146,000,000			100,000,000	*85,936,806			
Pulp wood . . . . "			1,986,310	3,192,223	4,001,607	4,094,306	4,328,052	
Distillation . . . . "				676,739	1,265,157	1,450,439	1,221,359	
Excelsior . . . . "							142,944	
Tanbark . . . . "			1,616,065	1,104,045	† 1,078,990			
Cooperage:								
Staves . . . . M			1,658,375	2,464,689	2,408,779	1,816,538	1,686,166	
Hoops . . . . M			440,859	546,879	375,793	295,712	353,215	
Heading . . . . M			111,180,000	125,353,528	160,925,201	123,110,254	136,717,225	

* 1908. † Tanbark woods, etc., tons.

The lumber cut for 1913 was reported at 38,387,000 feet B. M. The tendency towards concentration and enlarged establishments, so marked in all branches of manufacture, is evident in this industry, for the increase in the number of establishments has not kept pace with the increase in capital, investment, and annual product, as shown in the following table (thirteenth United States census, 1910):

TABLE II. LUMBER INDUSTRY, ESTABLISHMENTS, CAPITAL, AND PRODUCT

	1879	1889	1899	1909
Number of establishments *	28,851	26,913	38,110	44,804
Capital invested	$224,840,197	$691,065,233	$752,653,962	$1,182,330,552
Annual value of product	319,720,634	647,093,674	773,181,142	1,160,644,628

* Includes saw mills, logging camps, planing mills, and box factories.

Tables III and IV, taken from "The Lumber Trade of the United States" and "Exports and Imports of Farm and Forest Products," issued by the Bureau of Statistics (see *Bibliography* at end of article), show the foreign lumber trade of the country.

The logging camps, saw mills, planing mills, and box factories, according to the census (thirteenth) of 1910, employed 784,989 people. The industries which subsist wholly or mainly upon wood employ 1,500,000 men and women.

The yearly growth in the forests of the United States probably does not exceed 12 cubic feet per acre, according to estimates by the United States Forest Service, giving a total yearly growth of less than 7,000,000,000 cubic feet. Normal annual consumption approximates 90,000,000 cords of firewood, 40,000,000,000 board feet of lumber, 130,000,000 sets of heading, 350,000,000 barrel hoops, 4,000,000 cords of native pulp wood, 165,000,000 cubic feet of round mine timber, and 1,250,000 cords of wood for distillation. A total of about 23,000,000,000 cubic feet is cut annually. The annual cut, not including loss from fire, is therefore more than three times the growth. The annual per capita consumption in the United States of 260 cubic feet is far greater than that of any other country. That of Germany is 36 cubic feet and of France 24 cubic feet.

Conservation of the Timber Supply. Until recent years the greatest wastefulness characterized lumbering operations in America. This was due chiefly to the abundance of very accessible virgin stands which could be acquired in unlimited quantities at small cost and held cheaply; low prices for the best grades of lumber and prices for lower grades which made it impossible to handle at a profit material which would produce largely the latter; and the desire to clear lands rapidly for agricultural purposes. Forest fires have been responsible for the destruction of timber equal or greater in amount than that cut and utilized. As successive forest areas have been exhausted the lumber trade has moved to the West and South. The removal and destruction of forests without replacements have also vitally affected the water resources of the nation and have led to the passage of an act by Congress authorizing the purchase of lands for the protection of navigable streams and the administration of such lands as national forests. The most important developments in the conservation of the timber supply are: improved utilization by lumbermen, the development of forest policies, and the practice of scientific forestry, including fire protection, by the Federal government, by many States, and to some extent by municipal and private owners. A decreasing lumber supply, higher prices for timber products, improved methods and .machinery, and better transportation facilities have made more complete utilization possible.

TABLE III. EXPORTS OF WOOD AND MANUFACTURES OF WOOD, BY CLASSES

KINDS	1891	1895	1898	1900	1910
Sawed timber..........................M feet	214,612	297,693	338,575	473,542	451,721
Hewn timber...................... cubic feet	6,900,073	6,039,539	5,489,714	4,416,741	3,245,196
Logs and other......................dollars	2,274,102	1,813,894	3,189,820	5,020,471	3,432,635
Boards, deals, planks...................M feet	613,406	588,781	790,659	1,046,758	1,684,489
Joist and scantling.................... " "	11,324	27,454	35,610	41,043	26,272
Shingles..................................M	42,463	40,122	50,524	86,118	17,292
Shooks, box.........................dollars	199,674	359,451	486,860	587,047	1,121,613
Shooks, other........................ "	450,492	565,404	557,895	773,019	1,654,611
Staves...............................number	....	....	54,142,759	49,011,533	49,783,711
All other lumber ....dollars	886,113	1,642,370	3,256,880	3,091,336	5,355,245
Firewood and unmanufactured wood....... "	....	....	....	....	460,210

TABLE IV. IMPORTS AND EXPORTS OF WOOD AND MANUFACTURES OF WOOD

YEAR	Imports	Exports
1906.............	$36,532,706	$69,080,394
1907.............	42,969,941	83,349,575
1908.............	43,527,982	81,521,305
1909.............	43,690,427	67,867,432
1910.............	54,442,504	78,813,803
1911.............	52,931,803	92,255,951
1912.............	52,502,131	96,782,186
1913.............	61,824,088	115,704,777
1914.............	62,433,039	103,739,640

Forest Policy of the United States. In 1799 and again in 1817 Congress authorized the purchase of timber lands to supply the needs of the navy. After a long period of agitation the establishment of forest reserves, now national forests, was authorized in the Act of March 3, 1891. This authority, first exercised by President Benjamin Harrison, finally resulted in 1913 in the creation of 163 national forests with a gross area of 187,008,796 acres. The Act of June 4, 1897, provided for the administration of these areas, the sale and cutting of timber, and the use of other resources. On Feb. 1, 1905, the national forests were placed under the Forest Service in the Department of Agriculture, approximately 3000 forest officers being employed in the direct administration of these forests in 1913. The administration has resulted in the development of an efficient fire-protective system, the sale and cutting of several hundred million feet annually of mature timber under methods which will insure the perpetuation of the forest, a full use under regulation of forage resources, and the utilization of water power and other resources where available. The revenue derived in 1914 amounted to approximately one-half of the cost of administration and is gradually increasing. Waste lands are being reforested at the rate of approximately 30,000 acres per annum. See FORESTRY.

State Forestry. State forestry is largely a development of the twentieth century. In 1914 25 States had active forest departments, a majority of which employed professional foresters; in 20 States efficient fire-protection systems had been established; 14 had State forests aggregating 3,400,000 acres, the largest being New York with 1,644,088 acres, followed by Pennsylvania with 983,529 acres, Wisconsin 400,000 acres, Michigan 231,350 acres, and South Dakota 75,000 acres; and 10 States maintained State nurseries, with a total annual output of nearly 10,000,000 seedlings. The total appropriation by States for forest purposes, exclusive of those for educational institutions, exceeded $1,340,000. The following States had made some progress in the development of a State forest policy: Alabama, California, Colorado, Connecticut, Idaho, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Vermont, Washington, Wisconsin, and West Virginia. In 1914 at least 16 American universities had faculties of forestry, and a number of others gave general courses in forestry. In several colleges instruction in logging engineering is receiving increased attention.

Municipal and Private Forestry. There were in 1914 nearly 100 municipal forests in the United States, of which more than half were in Massachusetts. The practice of forestry on private lands, other than fire protection of virgin stands of timber, is greatly handicapped by illogical systems of taxation. Approximately 3,500,000 acres east of the Mississippi are reported to be under conservative management, while one-half of the area being cut over in the Pacific Northwest is being protected from fire and may be expected to produce a new stand. Where forestry is being practiced by private owners, logging is usually conducted in such a way that a part of the stand, consisting usually of the smaller trees, is left for a future cut and to perpetuate the forest. It is also becoming customary for private owners to dispose of logging slash in such a manner as to reduce the fire menace.

Fire Protection. Fire protection by private owners is the result of greatly increased stumpage values, the realization that the end of the timber supply is in sight, greatly increased investments due to high carrying charges, the demands of bondholders, and the educational activities and practical example of the Federal and State governments. Of the 545,000,000 acres of forest land in the United States, the

Federal government is protecting approximately 175,000,000 acres in the natural forests; 20 States individually and in coöperation with the Federal government are protecting about 100,000,000 acres. Thirty timber owners' associations individually and in coöperation with the Federal government and the States are protecting approximately 25,000,000 acres. Before protection was begun the annual fire loss in the United States was estimated by the United States Forest Service at $25,000,000, with 10,000,000 acres burned over. In 1912 the loss on the national forests was reduced to $75,000 and on State and private lands to $200,000. The protective system ordinarily adopted includes the disposal of slash in logging operations, the use of lookouts and patrolmen to cover the country during the dry season, plans for the rapid mobilization of fire fighters when they are needed, the construction of fire lanes, and of roads, trails, and telephone lines into inaccessible country.

TABLE V. LUMBER AND TIMBER PRODUCTION IN CANADA

	1910	1911	1912	1913
Lumber . . . . M feet B. M.	4,451,652	4,918,202	4,389,723	3,816,642
Square timber exported . . . . . . tons	37,962	34,847	65,906	....
Shingles cut . . . . M	1,976,640	1,838,474	1,578,343	1,485,279
Lath . . . . M	851,953	965,235	899,016	739,678
Ties . . . . purchased number	9,213,963	13,683,770	21,308,571	19,881,714
Poles . . . . " "	782,841	585,703	608,556	534,592
Pulp wood . . . . cords	....	672,288	866,042	1,109,134

TABLE VI. IMPORTS OF CANADA, WOOD AND MANUFACTURES OF WOOD

	1898	1900	1903	1905	1908	1910	1912	1913
Logs and round timber . . .	$137,000	$432,000	$389,000	$480,000	$526,000	$532,884	$821,173	$1,001,717
Lumber and timber	2,053,000	2,687,000	4,109,000	4,204,000	6,311,000	6,216,248	12,203,899	15,983,456
All other *	912,000	1,351,000	1,077,000	2,459,000	2,261,000	1,382,831	2,176,505	3,154,515

* Not including furniture.

EXPORTS OF CANADA, WOOD AND MANUFACTURES OF WOOD

	1898	1900	1903	1905	1908	1910	1912	1913
Timber and unmanufactured wood:								
Square . . . . tons	151,555	142,680	125,581	69,616	59,823	39,567	49,070	52,912
Value	$2,580,000	$2,014,000	$2,552,000	$1,514,000	$1,525,000	$934,723	$1,268,311	$1,263,200
Logs	1,801,000	779,000	434,000	480,000	697,000	999,681	767,492	1,028,456
Lumber:								
Blocks and other, for pulp	912,000	903,000	1,559,000	2,601,000	4,655,000	6,076,428	5,697,901	6,806,445
Boards, deals, and planks	17,986,000	21,741,000	26,526,000	23,218,000	29,424,000	31,366,872	26,769,788	27,739,339
Joists and scantling	246,000	236,000	451,000	868,000	1,046,000	1,295,365	1,180,905	1,254,138
Shingles	994,000	1,132,000	1,610,000	1,621,000	2,548,000	2,331,443	1,481,488	1,409,116
Shooks	117,000	251,000	440,000	439,000	206,000	240,721	243,103	265,042
Staves	401,000	550,000	284,000	145,000	216,000	94,479	55,834	57,707
All other	640,000	1,221,000	1,658,000	1,650,000	2,450,000	2,963,141	3,817,265	3,921,073
Wood pulp	1,210,000	1,816,000	3,151,000	3,399,000	4,038,000	5,204,597	5,094,305	5,509,944
All others	1,162,000	1,311,000	1,323,000	1,018,000	960,000	1,111,142	835,794	1,013,546

LUMBER TRADE IN CANADA

The area of forest land in Canada, the value of wood products, and the development of federal and provincial forestry are discussed under CANADA. The total stand of saw timber is variously estimated at from 350,000,000,000 to 600,000,000,000 feet B. M. The bulk of the timber is located in approximately equal amounts in the eastern and western portions of the Dominion, with scattering bodies of smaller and poorer timber in some parts of the interior. Methods of logging and manufacture have been developed along lines very similar to those in the United States. Table V, from the official Canadian reports, shows the timber production for 1910, 1911, 1912, and 1913.

Dr. Fernow estimates the total cut at about 2,400,000,000 cubic feet of finished material, or about 3,000,000,000 cubic feet in the forest. This is at least equal to the annual growth, not considering losses through fire. The annual per capita consumption is about 192 cubic feet, 60 cubic feet of which is in timber and 132 in firewood.

Table VI, from the first number of the *Statistical Abstract of Foreign Countries*, issued by the Bureau of Statistics, shows the foreign trade of Canada in wood and manufacture of wood.

LUMBER TRADE IN EUROPE

The accompanying Table VII (taken from Dr. Schlich's article on "The Outlook of the World's Lumber Supply" and "The Forest Resources of the World," by Raphael Zon) shows (1) the area of forests in Europe, (2) the net annual imports or exports of lumber, and (3) the annual cut and consumption of European countries. From this table it is evident that not quite one-third of the area of Europe is forest land, and that the average area per capita is about two acres; that the chief importers of lumber are Great Britain and Germany, and the chief exporters Russia, Austria-Hungary, and Sweden. On account of its small forest area (4 per cent of the total land area), its highly developed industries, and great coal production, Great Britain is the greatest timber-importing country in the world. The annual importation has increased at the rate of 189,900 tons for the last 35 years and at the rate of 332,000 tons for the closing decade of the century. America supplies approximately one-fifth of the imports, Russia one-fourth, and Scandinavia one-third. Since the imports are approximately one-half of the total imports of the globe, English market prices affect those of nearly all other countries. The price per ton for coniferous timber increased from £1 17s. 7d. per ton in 1895 to £2 3s. 2d. in 1899. Of the timber imported, 87 per cent was coniferous, 3 per cent oak, 3.6 per cent mahogany and other furniture woods, 3.6 per cent house and door frames, 2.8 per cent miscellaneous. German imports have increased steadily since 1863, when imports first exceeded exports, in spite of the fact that the German forests have been developed to their highest capacity. Their production of 50 cubic feet per acre per annum surpasses all other European countries. In Germany, in addition to the 4,726,000 tons of timber imported, there is an annual production of 42,650,000 tons, or 1,706,000,000 cubic feet, of timber from the German forests, of which 40 per cent is used for timber and 60 per cent for firewood. It is estimated that about 4,000,000 people in Germany are engaged in work connected with forest industries. In France the annual production of the native forests is about 22,768,500 tons, or 910,000,000 cubic feet, of which 75 per cent, mostly coppice woods, is used for fuel.

The net imports of France have remained practically stationary since 1875.

TABLE VII. AREA OF EUROPEAN FORESTS AND NET IMPORTS OR EXPORTS, CUT AND CONSUMPTION OF LUMBER IN EUROPEAN COUNTRIES *

COUNTRIES	Area of forests	Percentage of total area in forest land	Percentage of forest area belonging to state	Acres of forest land per capita	Tons imported annually net	Tons exported annually net	VALUE IN DOLLARS		Annual cut million cubic feet	ANNUAL CONSUMPTION	
							Imports	Exports		Total million cubic feet	Annual per capita cu. ft.
Sweden	48,000,000	44	27	8.9	…	5,498,000	…	32,975,000	954	404	120
Norway	17,000,000	21	12	8.4	…	1,585,850	…	9,075,000	345	276	125
Russia	516,000,000	40	61	5.9	…	9,360,000	…	58,850,000	7,370	6,813	
Bosnia and Herzegovina	6,790,000	53	70	4.9	…	…					
Bulgaria	10,650,000	45	..	3.2	50,000	…	244,000				
Spain	20,960,000	17	84	1.3	220,000	…	5,723,000				
Hungary	22,420,000	28	16	1.3							
Austria proper	23,990,000	32	7	1.0	…	†3,971,000	…	†45,120,000	†2,827	†2,500	†57
Servia	2,390,000	20	..	1.0	15,000	…	731				
Rumania	5,030,000	17	47	1.0	…	60,000	…	877,000			
Greece	2,030,000	16	80	0.9	35,000	…	633,000				
Luxemburg	190,000	30	..	0.9							
Switzerland	2,100,000	20	4	0.7	221,000	…	2,640,000	…	98	117	38
Germany	34,490,000	26	33	0.7	4,726,000	…	53,650,000	…	1,706	2,064	36
France	23,530,000	18	12	0.6	519,000	…	21,720,000	…	910	955	34
Italy	10,110,000	14	4	0.3	420,000	…	6,088,000	…	377	405	13
Denmark	600,000	6	24	0.2	470,000	…	6,088,000	…	25	49	19
Great Britain	3,030,000	4	3	0.1	13,064,530	…	131,522,300	…	138	671	14
Belgium	1,250,000	17	5	0.1	1,020,000	…	19,967,000	…	75	120	17
Portugal	770,000	3	8	0.1	60,000	…	974,000	…			
Holland	570,000	7	..	0.1	180,000	…	3,506,000	…	28	67	13
Turkey	6,180,000	8									
Total	758,080,000	31	..	2							
Net imports	…	..	..	..	…	…	…				

* Average data collected from the annual returns for 1896–1904 whenever available.
† Including Hungary, Bosnia, and Herzegovina.

Turning from the importing to the exporting countries of Europe, we find, as to the Russian forests, great difference of opinion among experts. M. Melard, French Inspector of Forests, in his pamphlet on *The Insufficiency of the Production of Timber in the World* (published June, 1900), states that Russia's surplus supply is being rapidly exhausted and that by the middle of the century she will have no more than is required for home consumption. On the other hand, the Director General of the Russian State Forests affirms that the utilization of the Russian state forests is considerably below the annual growth, and Russia will, for a long time to come, be able to keep up its production. This refers only to the state forests, or 314,000,000 acres out of a total of 516,000,000. The private forests have been badly overworked in recent years.

Russia's exports are greater than any other country of the world, and it is probable that the growing demands of the importing countries of Europe will be met largely from this source. In the 20 years preceding 1905 exports from Finland nearly trebled, while the number of saw mills quadrupled. In Russia, exclusive of Finland, exports more than doubled. In Austria-Hungary about 20 per cent of the forests are state-owned. Much of the private forest land is overworked, and the Director General of the State Forests has publicly stated that the standing crop of timber is some 30 per cent below the quantity necessary to maintain a permanent annual cut as large as that at present taken out of the forests. Exports, however, are still increasing steadily and more than doubled between 1880 and 1903. In Norway about 1,400,000 tons of lumber are annually manufactured into paper pulp. During the last 10 years the amount exported has slightly fallen off, and all authorities are agreed that the Norwegian forests have been overworked. Only about 12 per cent of the forest area is under government control. In Norway and in Sweden the more northern forests are situated in such a high latitude that growth is slow. In Sweden, however, one-fourth of the 48,000,000 acres of forest land is owned by the state and is under efficient state management. The manufacture of paper pulp and cellulose is rapidly increasing and annually consumes about 1,000,000 tons of coniferous timber. The cut in Sweden is still less than the annual growth, notwithstanding the fact that exports more than doubled between 1871 and 1903. The 1030 saw mills and planing mills of Sweden in 1898 employed 40,700 workmen.

ASIA, AFRICA, AUSTRALASIA, AND SOUTH AMERICA

Considering, last of all, the lumber trade and timber supply of Asia, Africa, Australia, and South America, we find that their annual imports exceed their exports 10 times. (See Table VIII.) China and Egypt have little wood. The remaining importing countries have extensive unworked forests, especially Australia. Japan has her forests under systematic management and imports comparatively little. India exports teak and some furniture wood and can do little more, since she has but 149,000,000 acres of forest land to supply a home population of about 300,000,000 people. The other regions export chiefly mahogany and other furniture woods.

TABLE VIII. AREA OF FORESTS IN COUNTRIES OUTSIDE OF EUROPE, NET IMPORTS OR EXPORTS CUT AND CONSUMPTION OF TIMBER

COUNTRIES	Area of forests acres	Percentage of total area in forest land	Percentage of forest area belonging to state	Net imports tons	Net exports tons	Annual cut in million cubic feet	ANNUAL CONSUMPTION	
							Total in million cubic feet	Per capita cubic feet
Asia:								
Asiatic Russia	348,030,000	13	96	......	......	450		
India (Schlich)	149,000,000	24	..	......	55,000	239	237	0.8
Ceylon	6,762,880	42	56	10,000				
Japan	57,718,410	59	..	5,000	......	2,055	...	30
Philippines	49,000,000	..	..	40,000				
Malay States	101,560							
Straits Settlements	88,320	9						
Cyprus	448,000							
China	....	..	..	50,000				
Australasia:								
British Australasia	126,720,000	20	11	160,000				
Java	4,920,000							
Hawaiian Islands	1,224,992							
Africa:								
Cape Colony, Natal, Swaziland, Transvaal	640,502	..	..	200,000				
Mauritius	87,680	..	..	20,000				
Madagascar	25,000,000	19						
Barbary States	9,526,865	..	75					
Central Africa	224,000,000	..	..	......	*28,000			
South America (tropic)	528,000,000	..	..	330,000				
West Indies	42,668,800	66	..	......	†13,000			
North America:								
Canada	550,000,000	38	..	......	2,680,000	3,000	1,432	192
Mexico	25,000,000	5	..	......	....	37		
Alaska	107,000,000	..	..	40,000				
United States	545,000,000	29	19	......	1,275,000	23,000	23,000	260
Total	2,800,938,009							

* West Coast. † Includes Mexico, New Guinea, and Honduras.

It appears that the supply of hard and other tropical woods is abundant to meet the demands of the lumber trade for years to come, and that when the present sources of supply are exhausted, others may be opened in the unexplored regions of Central and South America and Africa. On the other hand, there seems to be danger that the supply of coniferous woods, which constitute the bulk of the lumber trade, may be speedily exhausted, not only in the United States, but also in the markets of the world. The only sources of an increased supply without overcutting are Russia and Sweden.

Bibliography. For statistics and general information on the lumber industry, consult: Schlich, "The Outlook of the World's Timber Supply," in *Journal of the Society of Arts* (London, 1901); Raphael Zon, "The Forest Resources of the World," in *Forest Sense, Bulletin 83;* see also B. E. Fernow, *One Hundred Years of American Commerce* (New York, 1895); the pamphlet by M. Melard, Inspector of Forests at Paris, on *The Insufficiency of the Production of Timber in the World* (Paris, 1900); "The Lumber Trade of the United States," in the *Monthly Summary of Commerce and Finance* (Washington, 1900); J. E. Defenbaugh, *History of the Lumber Industry of America*, vols. i, ii (Chicago, 1906–07); T. H. Sherrard, *National Forests and the Lumber Supply* (Washington, 1907); B. E. Fernow, *Brief History of Forestry in Europe, the United States, and Other Countries* (Toronto, 1910); Kellogg and Ziegler, *Cost of Growing Timber* (Chicago, 1911); R. M. Harper, *The Forest Regions of Mississippi in Relation to the Lumber Industry: A Geographical and Statistical Study* (Nashville, Tenn., 1913); also publications of the United States Forest Service (Washington, 1895 et seq.); United States census, twelfth and thirteenth (ib., 1902, 1912). See CONSERVATION; FOREST; FORESTRY; WOODWORKING MACHINERY.

LUMBER STATE. Maine. See States, Popular Names of.

LUM'BRICOID (from Lat. *lumbricus*, intestinal worm + Gk. εἶδος, *eidos*, form). A nematode worm found as a parasite in the human intestine, the *Ascaris lumbricoides* being the most common variety. It is a reddish-yellow worm from 8 to 16 inches in length, and nearly ½ inch in diameter, round, and with a tapering tail. It is transmitted to human beings without an intermediate host, the eggs which contain embryos being swallowed in drinking water and resisting the action of the digestive fluids. It is generally harmless, though in some cases it has undoubtedly caused death by entering the bile ducts and gaining access to the substance of the liver, the pancreatic duct, and even the air passages, the Eustachian tubes, and the lachrymal ducts. Roundworms have found their way into the peritoneal cavity and have been discharged from abscesses in the abdominal wall. A mass of 80 or 100 of these worms has been found at one time in the small intestine. During a course of years thousands of worms have been passed *per rectum* by one victim. Reflex nervous symptoms have been caused by them in the majority of cases, and paralysis, convulsions, epilepsy, catalepsy, and tetanoid states have been attributed to them with great reason. Among the drugs used to procure expulsion of the roundworm are brayera, santonin, spigelia, turpentine, and chenopodium. These drugs should, as a rule, be given to a fasting patient and followed after some hours by a purge.

LU'MEN. See Illumination.

LUMHOLTZ, lụm'hôltz, Carl Sofus (1851–1922). A Norwegian explorer and ethnologist, born at Faaberg, Gudbrandsdalen. He at first prepared for the ministry. The University of Christiania, where he had studied, sent him in 1880 to Australia to make ethnographical collections. For four years he lived among wild tribes, and in 1889 he published *Among Cannibals*. In 1888 he lectured in America and in 1889 exhibited his Australian collections at the Paris Exposition. For the Geographical Society of New York he studied (1890–93) the cave dwellers, Indian tribes of northern Mexico, among them the Tarahumare, direct descendants of the Aztecs; in 1894–97 he made investigations among Indian tribes farther south for the American Museum of Natural History; and again, in 1898, he visited the same regions accompanied by Dr. Hrdlička. The results of these explorations were large ethnographical and archæological collections, and *Symbolism of the Huichol Indians* (1900), *Blandt Mexicos Indianere* (2 vols., 1903; trans. into many languages, in Eng. as *Unknown Mexico*, 1903), and *Decorative Art of the Huichol Indians* (1904). In 1909–11 his studies of the little-known Papago Indians of Sonora, Mexico, and Arizona provided material for *New Trails in Mexico* (1912). In 1912 he began a three years' exploration of New Guinea for Norwegian and English scientific societies.

LUMIÈRE, lụ'myâr', Antoine (1839–1911). A French painter and inventor. In 1904 he began experiments with the aid of his sons, August and Louis, in the art of color photography, and in 1907 announced from his Paris laboratory the splendid results of his investigations. See Color Photography.

LUMINAIS, lụ'mê'nâ', Evariste Vital (1822–96). A French genre and historical painter, born at Nantes. He was a pupil of Cogniet and of Troyon in Paris, where he first exhibited chiefly spirited scenes from popular life in Brittany, such as "Breton Fair" (1847); "The Pirates" (1850); "Reading the Will" (1853); "Hunting for Sea Birds' Nests" (1855); "Two Guardians" (1864, Angers Museum). Afterward he drew his subjects more frequently from the mediæval history of France, especially of the Merovingian period. They are painted with technical ability and truth to nature. Prominent among these are "Gallic Revenge" (1869); "Brunhild" (1874); "A Hunt under King Dagobert" (1879); "The Last of the Merovingians" (1883); "Death of Chilperic I" (1885). Several of his numerous productions are in the provincial museums of France, notably "Defeat of the Germans at Tolbiac" (1848) and "Return from the Chase" (1861), both at Nantes; "Gauls in Sight of Rome" (1870), at Nancy; "Advance Guard" (1870), at Bordeaux. His best-known work, "Les Enervés de Jumièges" (The Enervated Princes of Jumièges), is in the Museum of Sydney, Australia.

LUMINISTS. See Impressionist Painting.

LUMINOS'ITY. See Flame.

LUMINOSITY OF ANIMALS (ML. *luminositas*, splendor, from Lat. *luminosus*, shining, from *lumen*, light, from *lucere*, to shine; connected with Gk. λευκός, *leukos*, white, Skt. *ruc*, to shine, OChurch Slav. *lucha*, moon, OIr. *lōche*, lightning, OHG. *lioht*, Ger. *Licht*, AS. *lēoht*, Eng. *light*). The property possessed by many animals of giving off from the whole or part of their surface a light similar in appearance to that of phosphorescence. This light was at first supposed by many to be in some way due to the presence of phosphorus in the animal's tissue, and hence the name "phosphorescence" was first given to this kind of luminosity. Subsequent investigation has made it certain that phosphorus has nothing whatever to do with the phenomenon. This kind of light continues or is emitted only in the presence of oxygen. Fabre demonstrated that the luminous mushroom (*Agaricus*) gives off more carbonic-acid gas while luminescent than at other times, and Max Schultze has called attention to the fact that the photogenic cells of the lightning bug are always found in close relation with the tracheæ. If these photogenic cells are placed near perosmic acid, they draw oxygen from the acid. Radziszewski has studied the conditions under which chemical substances exhibit luminescence and has found that a whole series of substances emit light when they are permitted to combine with oxygen in an alkaline solution. Such substances are fats, ethereal oils, hydrocarbons, and alcohols; but heat is necessary with some of them for the production of light. Since in living tissue fats, oils, and the like are present, together with substances which give an alkaline reaction, the conditions that are essential for luminosity are present. Wielowiejski and Emery conclude that the photogenic substances exist in the cells of the luminous organs and may be in the nature of fats, while Dubois, from his studies on *Pyrophorus*, considers the light to be due to two substances, "luciferase" and "luciferine." Luciferase he believes to be in the nature of an enzyme which exists in the form of minute granules. The second substance exists in the blood and becomes luminous only when it is borne into the luminous organ.

Watasé believes the photogenic material to be the product of secretion of the cell, formed as the result of metabolism in the cell, and in the process of its formation identical with that known as secretion. He says further that the process of secretion does not necessarily imply the existence of a gland; the fundamental process of secretion may be carried out by an isolated single cell just as well as by thousands of similarly constituted gland cells. For the luminous apparatus of deep-sea fishes, see LANTERN FISH and the accompanying Plates.

The emission of light by living substances is widespread. It is an especially significant fact that, of the wonderful pelagic animals whose delicate transparent bodies occupy the upper strata of the sea and float about as plankton, almost all possess luminous power. Associated with this fact is the presumption that the luminous capacity of living substances is possibly much wider spread than is realized, that we do not see the light because the organisms are not transparent or because the production is too feeble to allow the light to be seen through thick body layers; indeed, it is not impossible that in our own bodies certain cells may be photogenic. In most cases, as in luminous insects, Verworn says, the power of emitting light is a peculiarity specially perfected by selection, and possesses its own significance for the life of the animals in question. In pelagic marine animals, also, such a significance is certainly present; as a rule, these animals emit light suddenly and only upon stimulation, and hence it may be supposed that the light serves as a means of frightening enemies.

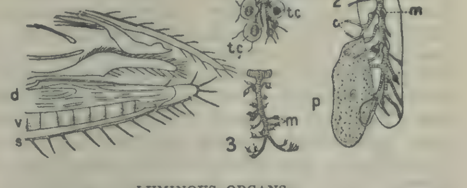
Luminescence is a phenomenon common both to animals and plants. Thus, certain bacteria that live in sea water, or those of putrefaction, such as *Bacterium phosphorescens*, which lives on dead flesh, cause luminescence. At least two kinds of these bacteria are known to produce a blue light, and one a greenish light. It is easy to make artificial cultures of these forms so as to study their growth and activities. Certain mushrooms of the genus *Agaricus*, which grow upon wood and cause its decomposition, are also luminescent. The blossoms of nasturtium, marigold, poppy, and other plants, and even the leaves, have been observed to emit light occasionally. Possibly the light in the latter cases is of electrical nature.

According to the way in which their luminescent powers are used, animals may be divided, according to Watasé, into three groups. 1. The photogenic substance is thrown out of the body and becomes luminous when it comes in contact with the oxygen of the air or water; this substance may be liquid as in the case of *Pholas* and copepods, or fine granules as in *Chætopterus*, earthworms, and myriapods. 2. In the second class the photogenic material is never thrown out of the body. Oxidation is accomplished by the oxygen which is taken in with the air or the blood, as in the case of fireflies and glowworms. Such organisms can usually control their luminescence. 3. In the third group there are no special photogenic organs. The light-giving material, however formed, accumulates along the course of muscle fibres or other contracting organs and emits scintillating light at the time of protoplasmic contraction. In such forms as the *Noctiluca* luminescence seems to occur in myriads of fine points. In this form, too, myriads of fine strands of protoplasm are continually expanding and contracting throughout the protoplasm of the animals. Heat and light are variations of the same radiant energy. They differ in degree, but not in kind. Hence the heat and light producing particles in these luminescent organisms may be very similar. They may simply be variations of the same chemical substance. Infusoria, rhizopods, polyps, medusæ, echinoderms, annelids, tunicates, mollusks, crustaceans, myriapods, and insects all have luminescent species. *Noctiluca*, one of the most brilliant, is an infusorian which occurs in certain parts of the ocean in prodigious numbers. Jellyfishes, ctenophores, and the tunicate *Pyrosoma* give out a considerable volume of glow when irritated. *Scolopendra* among myriapods, and beetles, gnats, and May flies among insects, are luminous in air. Among insects there is a larva of a New Zealand fly (*Boletophila luminosa*) which emits light. Gnats of the family Chironomidæ are sometimes entirely luminous with the exception of the wings.

A case is recorded by Kane in his last voyage to the polar region of human luminescence, and a few other cases have been recorded by several good authorities where, especially a short time before death, the human body had a luminous appearance. It is interesting to note in this connection that the "steady and permanent brilliancy of *Noctiluca* denotes approaching dissolution."

The light produced by protoplasm is the most economical light known, for all the energy is converted into light, so that there is no loss in the form of heat or chemical rays. Langley and Very compared the light of insects with that of the sun by superimposing their spectra, and found that the spectrum of the sun, with equal luminosity, extends farther both towards the violet and the red ends of the spectrum, but the light of the *Pyrophorus* is more intense in the green region than sunlight. Hence both the heat rays (the red) and the chemical rays (the blue) are practically absent from the spectrum of *Pyrophorus*.

Among insects, besides the well-known fireflies (Lampyridæ), luminosity is confined to a few other beetles, as certain Elanteridæ (*Pyrophorus*), an Indian buprestid (*Buprestis ocellata*), and a telephorid larva. The so-called phosphorescence of insects and other animals is a greenish scintillating or glowing light. The seat of the light is the intensely luminous areas situated either in the abdomen (Lampyridæ) or in the thorax (*Pyrophorus*). Each is a specialized portion of the fat body, being a plate



LUMINOUS ORGANS.

1. Section through end of body of male firefly (*Luciola*): *d*, dorsal layer; *v*, ventral layer of the luminous plate; *s*, skin. 2. Ventral layer isolated: *tr*, trachea; *p*, parenchyme cell; *c*, capillary trachea; *m*, coagulum. 3. A tracheal stem. 4. A part of No. 3, more highly magnified. (After Emery.)

consisting of polygonal cells, situated directly under the integument, and supplied with nerves and fine tracheal branches.

Lang says that the cells of this luminous organ secrete, under the control of the nervous system, a substance which is burned during the appearance of the light; this combustion takes place by means of the oxygen conveyed to the cells of the luminous body by the tracheæ, which branch profusely in it and break up into capillaries. Emery states that the males of *Luciola* display their light in two ways. When at nighttime they are active or flying, the light is given out at short and regular intervals, causing the well-known sparkling or scintillating light. *Luciola* flying in the daytime, or injured, gives out a tolerably strong light, though not nearly reaching the intensity of the sparkling light. In this case the light is constant, yet the phosphorescent plate is not luminous in its whole extent, but glows at different places as if phosphorescent clouds passed over it.

As to the use to the animal of this luminosity, it is generally supposed to allure the females, but Emery thinks it is a means of defense, or a warning or danger signal against insectivorous nocturnal animals, such as bats, since when crushed the firefly (*Luciola*) emits a disagreeable cabbage-like smell, though it has no acrid taste. The eggs of fireflies are luminous, but this is probably due to portions of the fat-body cells accidentally adhering to the outside of the egg. The larvæ are luminous at different ages, while the position of the luminous organs changes with age. In the larva of *Pyrophorus* before molting the light apparatus is situated only on the underside of the head and prothoracic segment. In larvæ of the second stage there are added three shining spots on each of the first eight abdominal segments, and a single luminous spot on the last segment. In the adult beetles there is a luminous spot on the underside of the first abdominal segment, but the greatest amount of light is produced by the vesicles on the hinder part of the prothorax (Dubois).

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LU'MINOUS PAINT. A phosphorescent substance that may be used for illuminating street plates, buoys, clock dials, etc. After being exposed for some time to ordinary light, the paint will for many hours emit a violet light in the dark. Luminous paint for use on paper may be made by dissolving 10 parts (by weight) of pure gelatin in 40 parts of hot water, then adding 1 part of glycerin and 30 parts of phosphorescent powder. The latter is obtained by heating pure sulphide of calcium and mixing it with a small quantity of bismuth salt. Calcium tungstate, either alone or mixed with other phosphorescent material, makes a highly luminous paint. The paint will withstand exposure if 2 parts of the phosphorescent powder are mixed with 3 parts of a colorless varnish; an additional coating of varnish may serve for further protection. See PHOSPHORESCENCE.

LUMMER, lo͞om'ẽr, OTTO (1860–). A German physicist, born in Gera. He was educated at the universities of Tübingen, Berlin, Jena, and Munich. He became Von Helmholtz's assistant in Berlin in 1884 and in the Physical-Technical Institute at Charlottenburg in 1887. In 1901 he was made privatdocent for physics at Berlin and in 1904 professor and director of the Institute of Physics at the University of Breslau. Dr. Lummer was an Imperial German delegate to the electoral congress in Chicago in 1893, and he delivered lectures at Columbia University and elsewhere in America in 1907. His distinctive work in physics was on light, especially interference and radiation. His name is connected with Pringheim's for their study of the "black bodies" and of the ratio of specific heats of gases, and with Broadhun's because of their photometer. Among his writings, besides contributions to technical periodicals, are: *Sur le rayonnement des corps noirs* (1900); *Contributions to Photographic Optics* (1900), translated by S. P. Thompson from three articles published in 1897; *Die Ziele der Leuchttechnik* (1903); and the volume on optics (2d ed., 1907) in the Müller-Pouillet *Lehrbuch der Physik*. He edited (1910) Ernst Abbe's *Lehre von der Bildentstehung im Mikroskop*.

LUMMI, lụm'mė. A Salishan tribe, formerly occupying the coast of Puget Sound between Skagit and Nooksak rivers, northern Washington. They entered into treaty with the government in 1855 and have since been gathered upon a small reservation within their original territory. They number 353. See SALISHAN STOCK.

LUM'MIS, CHARLES FLETCHER (1859–). An American author, born at Lynn, Mass. He studied at Harvard and from 1881 to 1883 edited a newspaper in Cincinnati. He was city editor of the Los Angeles *Daily Times* (1885–87) and afterward editor of the *Land of Sunshine*, a Los Angeles magazine, and its successor, *Out West*, until 1909. From 1905 to 1910 he was librarian of the Los Angeles Public Library. For five years he lived among the Indians in New Mexico. A great traveler, especially by foot and horse, he roamed through North and South America from Canada to Chile. One of the incorporators (1906) of the Archæological Institute of America, and the founder of the Southwest Museum, he deeded to the latter his valuable library and collections of Spanish-Americana. He became a member of the National Institute of Arts and Letters. His works include: *A New Mexico David* (1891); *A Tramp across the Continent* (1892); *The Spanish Pioneers* (1894); *The Man who Married the Moon, and Other Pueblo Indian Folk Stories* (1894); *The Gold Fish of Grand Chimú* (1896); *The Enchanted Burro* (1897); *The Awakening of a Nation* (1898); *My Friend Will* (1911).

LUMP'FISH. See LUMPSUCKER.

LUMP JAW. A disease of domestic animals, particularly of cattle. See ACTINOMYCOSIS.

LUMP'KIN, JOSEPH HENRY (1799–1867).

An American jurist, born in Oglethorpe Co., Ga. After graduating at Princeton he was admitted to the bar in 1820, but in 1844 was compelled by ill health to retire. In 1845 he became associate justice of the State Supreme Court and soon afterward was elected Chief Justice, a position which he held until his death. He was the first professor of law in the University of Georgia and held that position in 1859–61 and again from 1865 until his death.

LUMPKIN, Tony. The awkward son of Mrs. Hardcastle, in Goldsmith's *She Stoops to Conquer.*

LUMP′SUCK′ER (so called from the awkward shape of the fish and its adhering power), or Lumpfish. An uncouth fish of the family Cyclopteridæ (formerly Discoboli), oval in shape, and with the skin studded with conical bony tubercles. The fins are short, and the ventrals unite to form a sucking disk which can take hold of an object so firmly that several times the weight of a fish may be raised by lifting the fish after it has made an attachment. (See Illustration under Sea Snail.) In the breeding season the male puts on exceedingly rich colors—purple and blue above, orange red below, in many tints. It is numerous on both sides of the north Atlantic, where it stays about rocky shores, clinging to the bottom, moving slowly, and preying on smaller fishes, crustaceans, etc. It spawns near shore in spring, after which the female retires to deep water, leaving the male to watch over the eggs, which he is said to defend with great courage. The flesh is eaten by some persons, though nowhere highly esteemed, as it is soft and oily. Local names for this species in Great Britain are lumpfish and cock-paddle. Several other species are known in various parts of the world. Consult G. B. Goode, *Fishery Industries,* section i (Washington, 1884), and Garman, *Monograph of the Discoboli* (Cambridge, 1892).

LUMPY JAW. See Actinomycosis.

LUMSDEN, lŭmz′den, Louisa Innes (1840–). A Scottish educator. She studied in private schools in London and Brussels and at Girton College, Cambridge, where she was classical tutor in 1873–74. After a year at Cheltenham Ladies' College Miss Lumsden was the first head mistress of St. Leonards School at St. Andrews in 1877–82 and the first warden of University Hall for Women at the same university in 1895–1900. For her services to the university she received the honorary degree of doctor of laws. She was a leader in the woman suffrage movement in Scotland.

LU′NA. A town in ancient Italy, in Etruria, near Carrara; it is now known as Luni. The town owed its fame partly to its fine harbor, known now as the Gulf of Spezia, but far more to the famous *Marmor lunense,* for which see Carrara.

LUNA (Lat., moon; connected by some with Lat. *lucere,* to shine). The moon, worshiped, according to tradition, as a goddess by the Romans from very ancient times; the Selene (Σελήνη) of the Greeks. Her cult goes back to the primitive times of Italic nature worship. She had three temples in Rome: one on the Aventine overlooking the Circus Maximus, the construction of which is assigned to King Servius Tullius; a second, smaller, on the Palatine, kept illuminated at night, on account of which the goddess was called Noctiluca (giver of light by night); and a third, a mere shrine, close to or in the Circus Maximus itself. In Greek mythology Selene is the sister or wife of Helios, the sun. For identification of Luna with Artemis or Diana, see Diana. Consult Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

LUNA, lo͞o′nȧ, Alvaro de (?1385–1453). A Spanish courtier and statesman. He was at first a page at the court of Castile, but rose to be the favorite Minister of John II, who admired him as a fine horseman, an expert lance and master of fence, and a writer of graceful verse. In 1423 he became Constable of Castile. Through the machinations of the grandees he was twice banished, in 1427 and in 1439; but in each case the King soon discovered that he really needed his favorite. In 1445 Luna was elected by the Knights Grand Master of the Military Order of Santiago, and became commander in chief of the army. His fall was finally brought about by an intrigue, fomented by John II's second wife, Isabella of Portugal, who was offended at Luna's great influence and urged the King to free himself. Luna was arrested at Burgos, condemned to death in a trial that was a travesty of justice, and executed at Valladolid. Luna was one of the most ambitious men that ever lived. In an age of magnificence he made both a business and a pleasure of display. As Constable of Castile and Grand Master of Santiago, he was already the foremost man in Spain; but, not content with those honors, he had himself made Duke of Truxillo, Count of Gormaz, of San Esteban, and of Ledesma, and Lord of no less than 70 cities and castles; and, all told, his revenues exceeded those of the King. He had his brother appointed Archbishop of Toledo (the richest see in all the world) and Primate of Spain. He married his daughter to Iñigo López de Mendoza, second Duque del Infantado, and of the bluest blood in the Kingdom. The personality of Don Alvaro is fascinating despite his inordinate selfishness and his instability and infidelity. Historians hold the most conflicting opinions concerning his character. To Menéndez y Pelayo he appears as the strong man of the reign, to such an extent that the period should be called the reign of Alvaro de Luna and not the reign of John II; and his dignified death makes him almost a martyr. To Burke he appears in a much less favorable light. An interesting portrait of him is drawn by Fernán Pérez de Guzmán. The manner of his death made a deep impression upon the people, and a considerable body of literature, including numerous *romances,* developed in connection therewith. The *Chronicle of Alvaro de Luna,* written by some loyal follower who survived him, is a panegyric that makes interesting reading. The other contemporary authority, the *Chronicle of John II,* is much less favorable. Alvaro de Luna wrote a graceful defense of women, in his *Libro de las claras y virtuosas mugeres;* and his name figures in the *Catálogo de autoridades de la lengua,* published by the Spanish Academy.

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LUNA, JOHN OF. See JOHN OF SEVILLE.

LUNA, PEDRO DE (1334–1422 or 1423). Antipope, under the name of Benedict XIII. He was a native of Spain and received a cardinal's hat from Gregory XI (1375). On the death of the Antipope, Clement VII, in 1394, he was elected Pope by the Avignon cardinals, on condition that he should resign at the request of the College of Cardinals, or whenever the Pope at Rome should resign, so that a new Pope might be chosen and the great schism ended. This he steadily refused to do, although he was deposed by the Council of Pisa in 1409 and by that of Constance in 1417. After the election of Martin V he withdrew to the fortress of Peñíscola in Valencia and continued in schism till his death. He was the author of a treatise on canon law. See SCHISM, WESTERN.

LU'NACY (disease). See INSANITY.

LUNACY (from Lat. *luna*, moon). In law, the condition of a person who, by reason of mental derangement, whether congenital or acquired, is incapable of managing his own affairs or of understanding the nature and probable effects of his acts. In order to give a person the status of a lunatic it is not necessary that the disability shall be total, nor continuous, nor incurable. It is enough if the derangement of mental functions is such as to create a condition of irresponsibility, or manifests itself in delusions of a morbid character which affect the conduct in material respects or in marked irrationality of behavior. When an insane person becomes so incompetent mentally as to be unable to care properly for his own person or property, or as to be dangerous to the persons or property of others, it becomes the right and duty of the state to assume control over his person or property, or both, and when that is done his condition is technically known as lunacy. In England the King, as *parens patriæ*, is regarded as the natural guardian and protector of all legally incompetent persons within the realm. The execution of this duty was early delegated to the Chancellor, and the Court of Chancery thus became the tribunal to which jurisdiction over such unfortunates and their property was exclusively committed. As this jurisdiction of the Chancellor is not exercised by him primarily in his judicial capacity, it has been questioned whether courts of equity in the United States are vested with this part of the Chancellor's jurisdiction. The question is now unimportant, as all of the States have elaborate systems for the control and care of lunatics and their property, created and regulated entirely by statute.

So long as a person is not judicially declared incompetent he is entitled to his liberty and to manage his own affairs. At common law a private person might temporarily restrain an insane person to prevent an immediately threatened injury to such insane person himself or to others, but for any other or further restraint he was liable in damages for assault or false imprisonment. An early English statute made it a misdemeanor for one to receive two or more insane persons into his house for care or treatment unless the house was registered under the act as an asylum for the insane. When a legal investigation was to be made for the purpose of having one judicially declared a lunatic, it was the Chancery practice (which has been perpetuated with slight modifications by statute) to issue an order or decree, upon the petition of a relative of the lunatic or of a proper public officer, appointing a commission *de lunatico inquirendo*—to inquire as to the lunacy of the person named in the order. The commission is usually, although not always, composed of a layman, or in some States of a lawyer, a physician, and a layman; and it is its duty to take evidence upon the question of insanity and to determine, in some States with the aid of a jury, the question of the legal competency of the accused. Generally notice is required to be given to the lunatic, and sometimes to his relatives or the person with whom he resides; and unless dangerous he must be given opportunity to appear before the commission and be heard in his own defense, failing which his constitutional right not to be deprived of liberty without due process of law would be violated. Upon the report of the commission that the person named in the order is a lunatic, the Chancellor, or the court having corresponding jurisdiction, adjudges him to be a lunatic and appoints a committee, or in some States a guardian, to take charge of the lunatic's person and property, or, in its discretion, appoints separate committees as guardians of the person and of the property respectively. The lunatic then ceases to have most of the attributes of a legal person. He has no power to contract or in any way dispose of his property by deed or will. He is, however, liable in quasi contract for the value of necessaries furnished to him by any proper person. He is still liable for torts committed by him and may sue and be sued, although generally all litigation must be carried on in the name of his committee. The committee or guardian of the property has very limited power over the property, being merely the bailiff or receiver of the court acting under its direction. The income of the lunatic's property may be used for his maintenance, but in general the committee may sell it only upon order of the court, and then only for the lunatic's maintenance or for the purpose of reinvestment. The committee of the person of the lunatic has general charge of and control over him, and may cause him to be confined in such asylum as is authorized by law to receive and care for lunatics. It is now the universal practice to regulate by statute the care of the incompetent insane and to permit their confinement only in places designated by law and subjected to the frequent inspection of State lunacy commissioners or corresponding officials. If one is improperly restrained of his liberty on the ground of insanity, he may resort to the writ of *habeas corpus;* and in some States he has a statutory right to a writ *de lunatico inquirendo.*

The functions of the committees or guardians both of the person and the property cease upon the death of the lunatic, or upon the return of his sanity when judicially determined. They may also be discharged from their duties by order of the court for cause, or whenever they ask upon reasonable grounds to be relieved of their duties; and it then becomes the duty of the court to appoint a new committee or guardian. See INSANITY.

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LUNALILO, lo͞o'nȧ-lē'lô, WILLIAM C. (1835–74). King of the Hawaiian Islands. On the death of Kamehameha V the people chose Prince Lunalilo to be King, in January, 1873. After a brief reign, which was marked only by a growing feeling of race hatred and by the mutiny of his household troops, he died at Honolulu on Feb. 3, 1874. He was succeeded by David Kalakaua.

LUNA MOTH (so called from the luniform eyespots). One of the largest and most beautiful of the American moths (*Tropæa luna*), whose wings expand 5 inches. It is light green in color, with a purple-brown band along the front margin of the anterior wing, and an eyespot on each wing consisting of a transparent centre and rings of white, yellow, blue, and black. The posterior wings are prolonged into two long tails. The caterpillar, when full grown, is 3 inches long, and is pale bluish green, with a pearl-colored head, a pale yellow stripe along each side of the body, and a transverse yellow line on the back between each two abdominal segments. It feeds on black walnut, hickory, beech, oak, maple, and other forest trees. The cocoon is usually inclosed in leaves, and is not so compact as that of the polyphemus moth (q.v.); it is either spun on the ground or falls there with the autumn leaves. The moth emerges the following summer, and there is only one generation each year.

LU'NAR CAUSTIC. Fused nitrate of silver when cast into cylinders smaller than a slate pencil. It is white or pale gray when freshly prepared. Exposure to the air blackens and decomposes it, and when applied to the healthy skin it leaves a brownish stain which later turns black. To remove this stain a saturated solution of potassium iodide is applied.

It is used locally in surgery for its antiseptic, hæmostatic, astringent, caustic, and stimulant properties. Spongy or exuberant granulations (popularly known as proud flesh) are destroyed by it; indolent ulcers, sores, sinuses, and cracked and fissured skin are healed by it. It may be applied to the site of a wart which has been scraped away. It is an excellent application for fissured nipples, for trachoma, and for mucous patches of mouth and throat. Nitrate of silver mixed with nitrate of potash and molded like lunar caustic forms the "mitigated stick," or *argenti nitras dilutus*. This is employed when a less severe action is desired.

LUNAR CYCLE. See METONIC CYCLE.

LUNAR THEORY. A theory dealing with the disturbances in the moon's orbit produced by the other heavenly bodies which attract the moon. Of these, the sun is the only one that affects the moon directly. The planets also act upon the moon, but their mass is too small and their distances too great to produce any sensible effect. They do, however, disturb the earth in her orbit, and so in an indirect way affect the moon. The fact that the earth is not a perfect sphere produces also a few disturbances.

The lunar theory is the most difficult part of mathematical astronomy, and is still incomplete, involving as it does the Problem of the Three Bodies (q.v.). The three bodies are the moon, the earth, and the sun. The sun's mass is 330,000 times that of the earth, and its distance 389 times that of the moon from the earth. Since the attraction of one body on another varies directly as the mass and inversely as the square of the distance, the sun's attraction on the moon equals $\frac{330000}{389^2} = 2.18$ times that of the earth. Thus, the sun's attraction is more than twice as great as that of the earth, and if both were fixed in space the sun would naturally pull the moon away from the earth. Since this is not the case and the sun attracts the earth almost as much as it does the moon, the result is that both fall towards it, combining this motion with that in the orbit.

At new moon the moon is nearer the sun than at any other place in the orbit, and the sun's attraction is then the greatest. Therefore at new moon the curvature of the moon's orbit towards the earth is diminished, while at quadrature (q.v.) it is increased. It is convenient to resolve the disturbing force of the sun into three components, the *radial*, *tangential*, and *orthogonal*. The effect of the radial component is to draw the moon towards or away from the earth. This force is a maximum at syzygies and quadrature, and vanishes whenever the disturbing force becomes perpendicular to the radius, which happens at 54° 44′ on each side of line of syzygies. It is negative more than half way round. The effect of this is to lessen the earth's attraction for the moon by nearly $\frac{1}{360}$ and to increase its mean distance. This makes the month about an hour longer than it would be otherwise.

The diminution of the earth's attraction for the moon at apogee (q.v.) and the reverse of this at perigee (q.v.) cause an oscillation of the line of apsides (q.v.). The disturbing force at apogee, however, predominates, and the line of apsides completes a revolution in about nine years.

The tangential component retards and accelerates the motion of the moon. This is the main cause of an inequality called the variation. Its maximum amount is 39′ 30″, and this is attained half way between the syzygies and quadrature. The orthogonal component tends to draw the moon towards the ecliptic. This causes the inequality known as the regression of the nodes (q.v.), which complete a revolution in about nine years. This force vanishes twice a year when the sun is at the nodes of the moon's orbit, since then they are both in the same plane.

Evection is another disturbance which puts the moon forward or backward in the orbit about 1¼°. It has a period of about one and one-eighth years, the time required by the sun to pass from the line of apsides to the same line again. The cause of this inequality is the increase and decrease of the eccentricity in the moon's orbit, caused by the increase and decrease in the earth's attraction on the moon.

The annual equation is an inequality produced by an increase in the sun's disturbing force, when the earth is nearer to the sun than its mean distance. As a result of this the month is lengthened or shortened, according as the increased disturbing force aids or retards the motion of the moon.

The secular acceleration of the moon's mean motion was discovered by Halley by comparing ancient and modern eclipses, and the moon is believed to have gained in this way one degree during the Christian era. Laplace (q.v.) explained this secular acceleration by the fact that the earth's orbit, under the action of other planets, is growing less eccentric. As a result of this the average disturbing force of the sun is diminished, and the month is shortened little by little. The period of this inequality is 25,000 years.

Of these irregularities, evection is the only one which was known to the ancients. It may affect the time of an eclipse by nearly six hours, and was discovered by Hipparchus 150 B.C. while observing an eclipse. The variation was discovered by Tycho Brahe. This does not affect the time of an eclipse, and therefore escaped the Greek astronomers. The inequalities mentioned above are only the principal ones. In the computation of nautical almanacs, about 70 are taken into consideration for determination of longitude, and half that number for latitude. Consult: Charles Delaunay, *Théorie du mouvement de la lune* (2 vols., Paris, 1860–67); Chauvenet, *Spherical and Practical Astronomy* (Philadelphia, 1863); Félix Tisserand, *Traité de mécanique céleste*, vol. iii (Paris, 1894); J. C. Adams, *Lectures on Lunar Theory* (Cambridge, 1900); E. W. Brown, *Introductory Treatise on the Lunar Theory* (ib., 1903). See MOON.

LU′NATIC. In law, a person whose reason has become so deranged that he cannot be held legally accountable for his acts. A lunatic cannot be held for a criminal act, as he cannot distinguish between right and wrong; his contracts are voidable; he cannot make a valid disposition of his property by will, and he should be represented by a committee or guardian for all legal purposes. A lunatic may have a lucid interval (q.v.) during which he is legally competent. Consult: *Redfield on Wills;* Ordronaux, *Jurisprudence of Medicine;* also LUNACY and the authorities there referred to.

LUNATIC ASYLUM. See INSANE ASYLUM.

LUNATION (Lat. *lunatio*, from *luna*, the moon). The period in which the moon goes through a complete sequence of its phases (q.v.), or the interval between two consecutive new moons.

LUND, lo͞ond. An episcopal city of Sweden, situated 5 miles from the Sound, 11 miles northeast of Malmö (Map: Sweden, E 9). Its cathedral, which is the largest and most beautiful Romanesque building in Scandinavia, dates from 1145, but it was well restored in the latter part of the nineteenth century. Near it are the university buildings, quite modern, having been erected in 1878, including the historical museum. The university has faculties of theology, law, medicine and philosophy; was founded in 1668, and is attended by some 1070 students, with 47 professors and 50 privatdocents. The chief industries of the town are sugar refining and the manufacture of machinery. Pop., 1901, 16,021; 1912, 20,423. In the Middle Ages Lund was long the largest city of Scandinavia. In the eleventh century it was the seat of a bishopric, which in 1104 was erected into an archiepiscopal see. The Archbishop of Lund claimed jurisdiction over all the sees of Scandinavia. Lund was often the residence of the Danish kings. The town suffered during the wars between Sweden and Denmark, and passed from the possession of the latter in 1658. Here the treaty of peace was signed in 1679 by which Skåne was permanently confirmed as a part of Sweden.

LUND, TROELS FREDERIK TROELS. See TROELS-LUND.

LUNDA, lụn′dȧ. Bantu peoples living north of Lake Bangweolo, British Central Africa, and occupying the southernmost section of the Eastern Province and of the Kasai District of the Belgian Congo. They are tall, well proportioned, with regular features, and a complexion lighter than among other tribes of the Bantus. They depend on agriculture and trade in ivory and slaves. They file the teeth, tattoo themselves, and smear the body with oil. All travelers agree that the Lunda are a mild, inoffensive people, remarkable in Africa for the deference they show to their women. Their empire was ruled on a feudal basis, with a male sovereign, Mwata Jamvo, and a female ruler, Lukokesha, at the head. The latter was unmarried, but was reckoned as the mother of Mwata Jamvo and had the decisive vote in the election of a new sovereign. Consult: P. Pogge, *Im Reiche des Muata Jamvo* (Berlin, 1880), and Lionel Portman, *Station Studies, Being the Jottings of an African Official* (London, 1902).

LUNDGREN, lụnd′grān, EGRON SELLIF (1815–75). A Swedish water-color painter and author. He was born at Stockholm and studied at the Academy there and afterward in Paris under Cogniet. He sojourned in Italy from 1841 to 1849, devoting himself to water colors. Thence he went to Spain and to England, where he was commissioned by Queen Victoria to paint ceremonial pictures. He was sent to India during the war in 1858, the results of the expedition being a series of 500 sketches, including numerous portraits. He subsequently spent much time in England, where many of his works are preserved, and in 1865 was chosen a member of the Society of Painters in Water-Color. Lundgren's art is spontaneous and spirited, and abounds in rich and piquant effects of color. He is at his best in his Spanish and Italian scenes, which include: "San Vitale, Ravenna," and "Dominicans in the Library of Siena," both in the National Museum, Stockholm; "Feast of Corpus Domini in Rome" (1841), Royal Palace, Stockholm; "A Barber's Shop, Seville," "A Spanish Posada," and "Rafaella" (1875). His descriptions of his travels were published at Stockholm in 1871–73 (2d ed., 1884). He also furnished a series of illustrations to "Old Swedish Tales" (1875).

LUNDIN′IUM. See LONDON.

LUN′DY, BENJAMIN (1789–1839). An American antislavery agitator, born of Quaker parentage at Hardwick, Warren Co., N. J. At the age of 19 he went to Wheeling, on the Ohio, where he worked as a saddler's apprentice. The town was a thoroughfare for the slave trade, and Lundy's indignation was quickly aroused against the whole slave system. His apprenticeship completed, he married, and, settling in St. Clairsville, Ohio, soon built up a profitable business. It was not long before he organized

The Union Humane Society, which soon numbered nearly 500 members. In 1819 he went to Missouri in the hope of strengthening the opposition to the admission of the Territory as a slave State, and while there he wrote a number of articles exposing the evils of slavery and the wickedness of its extension. After losing nearly all his property he returned to Ohio in 1821 and began the publication at Mount Pleasant of the *Genius of Universal Emancipation*, which he shortly afterward removed to Jonesborough, Tenn., and then again, in 1824, to Baltimore, Md. In 1825 he visited Haiti in search of a refuge for emancipated blacks, and four years later made another voyage to that country for the same purpose. Two years later he was brutally assaulted by a Baltimore slave dealer enraged over an article in the *Genius*. In 1828 he journeyed on foot through the Eastern States and made 43 public addresses. In the fall of 1829 William Lloyd Garrison (q.v.) joined Lundy in Baltimore as assistant editor of the *Genius*. The two were alike in their hostility to slavery, but Garrison was an advocate of immediate emancipation on the soil, while Lundy was committed to schemes of colonization abroad. Within a few months, while Lundy was absent in Mexico, Garrison published extremely radical articles demanding immediate emancipation and asserting that the domestic slave trade was as piratical as the foreign. Garrison was brought to trial for criminal libel and fined and imprisoned. This occurrence so reduced the circulation of the *Genius* that a friendly dissolution of partnership between Lundy and Garrison took place. It also raised up such a hostile spirit in Baltimore that Lundy shortly afterward removed the paper to Washington, where, after some years, it failed. In the winter of 1830–31 Lundy visited the Wilberforce colony of fugitive slaves in Canada. In the following two years he made two trips to Texas in an attempt to secure an asylum for negroes under the Mexican flag. In 1836 he started the *National Inquirer* in Philadelphia, but retired from it in 1838. In the latter year almost all his possessions, which were stored in Pennsylvania Hall, Philadelphia, were destroyed by a mob, which burned the building. In the following winter he removed to Lowell, Ill., where he reëstablished the *Genius of Universal Emancipation;* but after issuing a few numbers he was seized with a fever, and died Aug. 22, 1839. Consult Earle, *Life, Travels, and Opinions of Benjamin Lundy* (Philadelphia, 1847), and W. C. Armstrong, *Lundy Family and their Descendants of Whatsoever Name* (Nutley, N. J., 1902).

LUNDY ISLAND. An island of Devonshire, England, situated at the entrance to the Bristol Channel, about 9 miles from the mainland. It has an area of over 900 acres; there is a lighthouse. The inhabitants are mainly fishermen and were formerly notorious pirates and smugglers. The towering Shutter Rock at the south of the island plays a prominent part in Kingsley's *Westward Ho!* Pop., 1911, 49.

LUNDY'S LANE, BATTLE OF. A battle fought along the roadway known as Lundy's Lane, about 1½ miles from Niagara Falls, on the Canadian side, on July 25, 1814, between an American force under the command first of General Scott and then of Gen. Jacob Brown and a greatly superior British force under the command of General Riall. On the afternoon of the 25th General Brown, stationed with the American army at Chippewa, ordered General Scott, with about 1300 men, to advance towards Queenstown. The movement began between five and six o'clock, and after marching for about 2½ miles General Scott came upon a British force posted along Lundy's Lane. He immediately decided to attack. Major Jesup, commanding the American right, turned the British left, capturing a number of prisoners, including General Riall, but the American centre and left were less successful, though they held the greater part of their ground against superior numbers. Before nightfall General Brown arrived with reënforcements, and the fighting continued until some time after dark, little material advantage having been gained on either side excepting the capture of a strong battery by the Americans under the immediate command of Col. James Miller. Generals Brown and Scott having been wounded, the command of the Americans devolved on Gen. E. W. Ripley, who, after holding possession of the field for about an hour, retired to the original American encampment. The British force, including reënforcements which arrived during the battle, numbered altogether about 4500 men; that of the Americans about 2000. The American loss was 171 killed, 571 wounded, and 110 missing; while the British lost 84 killed, 559 wounded, and 42 prisoners. On both sides, but especially on the American, the loss in officers was great. The battle is also known as the battle of Bridgewater and the battle of Niagara.

LUNE, QUADRATURE (AREA) OF. See MENSURATION.

LÜNEBURG, lu̧′ne-bōōrk. An ancient town of the Province of Hanover, Germany, situated on the Ilmenau, a tributary of the Elbe, about 30 miles southeast of Hamburg (Map: Germany, D 2). It is mediæval in appearance, with its narrow streets, ancient buildings, and a portion of its former walls, but the suburbs are modern and are laid out in gardens. Its churches are of considerable architectural interest, notably that of St. John (fourteenth century), pure Gothic, with a lofty tower; that of St. Nicholas (1409); and that of St. Michael (1367–1418), with the tombs of the princes of Lüneburg. The Rathaus in the market place consists of a number of parts constructed from the thirteenth to the eighteenth century, and containing fine examples of ancient wood carving, glass painting, and mural decorations restored by artists of the modern Munich school. Other places of interest are the old law court, formerly a convent, the merchants' hall, and the public squares known as the Sand and the Market Place.

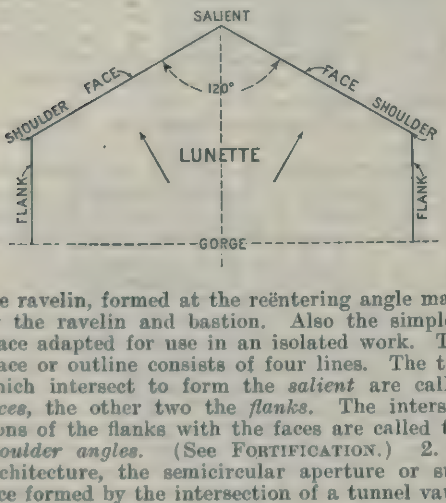
The educational institutions include a Gymnasium, a seminary for teachers, a museum, and a library. Lüneburg has been noted since ancient times for the deposits of limestone, gypsum, and salt in its vicinity. It still produces the last two minerals on a large scale. There are also mineral springs with baths. It has manufactures of chemicals, fertilizers, carpets, iron wares, cement, cooperage, haircloth, and wax. It raises fancy horticultural products; its trade is chiefly in grain, wood, wines, straw, hay, and wool. Pop., 1900, 24,693; 1910, 27,790, largely Protestants. The town gives its name to a large tract of moorland known as the Lüneburger Heide.

Lüneburg was a flourishing place in the Middle Ages. It emancipated itself from the rule of the dukes of Lüneburg (see BRUNSWICK, House of), became an influential member of the Hanseatic League, and at the time of the Reformation was one of the richest towns of north Germany. In the first half of the seventeenth century the city lost its independence, being brought under the sway of the dukes of Brunswick-Lüneburg. It subsequently shared the fortunes of Hanover.

LUNENBURG, lo͞o′nen-bûrg. A seaport of Nova Scotia, Canada, the capital of Lunenburg Co., on the Halifax and South-Western Railway, 40 miles west-southwest (direct) of Halifax (Map: Nova Scotia, E 4). Settled in 1753 by Germans, it retains a distinctly Teutonic character. Lunenburg has a capacious and well-sheltered harbor, shipbuilding yards, cooperages, iron and stove foundries, machine shops, gasoline-engine factory, and sail-making and block-making factories. There are a large fishing fleet and a considerable trade with the West Indies in lumber and fish. The United States is represented by a consular agent. Pop., 1901, 2916; 1911, 2681.

LUNES OF HIPPOCRATES. See Hippocrates.

LUNETTE, lů-nĕt′ (Fr., little mo͞on). 1. In fortification, a small work beyond the ditch of the ravelin, formed at the reëntering angle made by the ravelin and bastion. Also the simplest trace adapted for use in an isolated work. The trace or outline consists of four lines. The two which intersect to form the *salient* are called *faces*, the other two the *flanks*. The intersections of the flanks with the faces are called the *shoulder angles*. (See Fortification.) 2. In architecture, the semicircular aperture or surface formed by the intersection of a tunnel vault by another vault or a wall. If an aperture it is closed with glass, and when a surface it is often decorated with mural painting.



LUNÉVILLE, lụ′nâ′vēl′. A fortified town in the Department of Meurthe-et-Moselle, France, on the Meurthe, 21 miles by rail east-southeast of Nancy (Map: France, N., M 4). Its church of St. Jacques (1730–45) is decorated with fine frescoes and wood carvings and contains paintings by Girardet and Van Schuppen. The former palace of the dukes of Lorraine (1703–06) was erected by the architect Boffrand and later extended by Stanislas Leszczynski, the ex-King of Poland. It is used as barracks, and its gardens have been converted into promenades. It is an important cavalry station. The town has a college and a library and a museum in the town hall. The chief products are faïence, linen, machinery, motor cars, toys, hats, wagons, leather, and gloves. The trade is in agricultural products, wine, and local manufactures. Pop. (commune), 1901, 23,269; 1911, 25,587. At Lunéville, Feb. 9, 1801, Austria and the German Empire concluded a peace with France. The war which this treaty ended had begun in 1799, after the departure of Napoleon for Egypt, and is known in history as the War of the Second Coalition, England, Austria, Turkey, Russia, Portugal, and Naples all having combined against France. At first the allies were successful, but after Napoleon's return the Austrians were decisively defeated on June 14, 1800, by Napoleon himself at Marengo, and on December 3 by Moreau at Hohenlinden. The Emperor Francis thereupon accepted the Peace of Lunéville, which was based on that of Campo-Formio (q.v.). Germany west of the Rhine was relinquished to France, and an important change ensued in the composition of the German Empire through the secularization of ecclesiastical states and the incorporation of free cities with the hereditary principalities. These changes in the Empire were not consummated until 1803, when the Imperial Delegation published its conclusions. The Rhine from source to mouth was made the boundary of France. The independence of the Batavian, Helvetic, Cisalpine, and Ligurian republics was recognized; Austria was guaranteed the possession of Venetia as far as the Adige, which became the boundary of the Austrian possessions in northern Italy; the Grand Duke of Tuscany lost his land to the Duke of Parma; the Duchy of Modena was annexed to the Cisalpine Republic, its ruler receiving the Breisgau in exchange. The princes dispossessed on the left bank of the Rhine were to be indemnified by the secularization of ecclesiastical lands on the right bank. The treaty was signed by Francis II both as sovereign of Austria and as head of the Holy Roman Empire, though, by the fundamental law of the Empire, the Emperor could not bind the electors and states of Germany without their previous consent. The Germans occupied Lunéville within a month after the outbreak of the European War of 1914. They were forced to evacuate it by the Anglo-French offensive movement, which compelled the Germans to retreat on their long front, which was enveloping Paris. See War in Europe. Consult W. M. Sloane, *Life of Napoleon Bonaparte* (4 vols., New York, 1910).

LUNG, lo͞ong (Chin., dragon). The chief of the four supernatural beasts of Chinese legendary lore and of the 360 species of scaly reptiles. As usually represented the lung has a scaly, serpentine body, with four feet armed with long claws, a bearded scowling head, straight horns, a line of bristling dorsal spines, and flames proceeding from its hips and shoulders—the usual mark of a supernatural animal. Originally it was represented with three claws, but the number was increased, the Imperial dragon of the late Manchu dynasty having had five. This was the kind usually embroidered on the Emperor's robes and represented on the porcelains, etc., made for Imperial use. In Japan the Imperial dragon has only four claws. The Emperor's throne was called the dragon throne; his face was spoken of as the dragon countenance; the Imperial flag had a dragon on an Imperial yellow ground, and was styled the dragon banner, and when the Emperor died he was borne "on high" by dragons. The dragon has the power of rendering itself visible or invisible, and may become at will as small as a silkworm or assume such proportions as to fill the universe. There are many different kinds of lung: the celestial dragons, which guard the mansions of the gods; spiritual dragons, which rule the winds and produce rain; earth dragons, which direct the flow of rivers and springs. There is also a Buddhist dragon of the law, which is represented as firmly grasping the jewel of the law in its outstretched paws; and on old bronzes, as well as on porcelains and other objects, an archaic dragon called *Chih-lung* is sometimes found. It is lizard-like, has no claws on its feet, but has a spiral bifid tail. In art the celestial dragon is usually represented as moving rapidly through the clouds in pursuit of an effulgent jewel from which flames issue as it whirls through space, and which is supposed to be possessed of great magic efficacy. It was a yellow dragon which rose out of the river Loh in ancient times and presented to the view of Fu-hi (q.v.) the mystic symbols which form the *Pa-kua* (q.v.) or Eight Diagrams.

LUNG. See RESPIRATION, ORGANS OF.

LUNGARNO, lo͞on-gär′nô (It., along the Arno). The name given to the interesting streets bordering the Arno on either side at Florence. The different parts bear various names, the best known being the Lungarno Acciajuli, between the Ponte Vecchio and the Ponte S. Trinità, a section of jewelers. The same name is given to corresponding streets at Pisa.

LUNGCHOW, lụng′chou′. A walled town in the Province of Kwangsi, China, situated at the confluence of the Sung-chi and the Kao-ping rivers, a short distance from the frontier of Tongking (Map: China, J 7). It is a military station of some importance and has a considerable Chinese garrison. It was opened to French commerce in 1889, but so far its trade is insignificant. The town is connected by telegraph lines with Canton, Mengtsz, and Tongking. A railway line from Langson in Tongking to Lungchow was constructed by the French. Lungchow is one of the open ports; in 1912 foreign imports amounted to 76,532 taels, exports to 7303 taels, a total of trade for the year of 83,835 taels. The population is estimated at 13,000.

LUNGE, lụng′*e*, GEORG (1839–). A German chemist. He was born at Breslau, studied there and at Heidelberg (Ph.D., 1859), and was engaged in Silesia (1859–67) and at South Shields, England (1867–76), as chemist in the distillation of coal tar and the manufacture of soda, with which branches his writings mostly deal. In 1876 he was elected professor of chemistry in the Zurich Polytechnic, from which he retired in 1907. Among his works may be mentioned: *Die Destillation des Steinkohlen-Theers* (1867); *Industrie des Steinkohlen-Theers und Ammoniaks* (1867; 5th ed., 1912), with H. Kohler; *Handbuch der Sodaindustrie und ihrer Nebenzweige* (1879–80; 3d ed., 1909); *Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali* (1879–80; the following editions appeared under the title *Manufacture of Sulphuric Acid and Alkali;* 4th ed., 1913); *A Treatise on the Distillation of Coal-Tar and Ammoniacal Liquor* (1882; appeared in later editions under the title *Coal-Tar and Ammonia;* 4th ed., 1909); *Taschenbuch für die Sodafabrikation* (1883; 3d ed., 1900); *Alkali Makers' Handbook* (1884; 2d ed., 1891), with Hurter; *Chemisch-technische Untersuchungsmethoden* (1899–1900; 6th ed., 1910; Eng. trans., *Technical Methods of Chemical Analysis,* 3 vols., 1908–14); *Technical Gas Analysis* (1902; 2d ed., 1914); *Technisch-chemische Analyse* (1905; Eng. trans. *Techno-Chemical Analysis,* 1905); *Technical Chemist's Handbook* (1910).

LUNG FEVER. A disease of domestic animals. See PLEUROPNEUMONIA.

LUNG′FISH. A dipnoid fish, so named because of the presence of air-breathing organs in addition to gills. Their representatives were much more numerous in Paleozoic times (see COCCOSTEUS; DIPTERUS; and other names of fossil dipnoans) than at present, when the New Zealand *Ceratodus,* the African *Protopterus,* and the South American *Lepidosiren* alone represent the group. See DIPNOI and its plate; MUDFISH; BARRAMUNDA.

LUNGWORM (AS. *lungen,* OHG. *lungunna,* Ger. *Lunge,* lung; connected with AS. *lēoht, lēht, līht,* Goth. *leihts,* OHG. *lihti, līht,* Ger. *leicht,* Lat. *levis,* Gk. ἐλαχύς, *elachys,* Lith. *lengwus,* Skt. *laghu, raghu,* light, not heavy). In the lungs and air passages of the horse, ox, sheep, pig, and some other hosts are found round worms, commonly known as "lungworms," which often cause serious disease in the host. Among the more important forms are *Dictyocaulus* (*Strongylus*) *arnfieldi* in the horse and ass; *Dictyocaulus* (*Strongylus*) *filaria* in the sheep, goat, dromedary, and some other hosts; *Synthetocaulus* (*Strongylus*) *rufescens* in the sheep and goat; *Dictyocaulus viviparus* (*Strongylus micrurus*) in cattle; and *Metastrongylus apri* (*paradoxus*) in the pig and wild boar. Their presence may result in bronchitis or bronchopneumonia. The chief symptoms of the former in sheep are fits of coughing and sneezing, accompanied by discharges from the nostrils. Infected animals move about with the neck outstretched, rub the nose on the ground, and breathe with difficulty. A pronounced diarrhœa may also appear and hasten the usual emaciation. The wool becomes loose and may shed. The skin appears white and bloodless, which gives the disease the popular names "white skin" and "paper skin." The disease is most prevalent in years with a wet summer preceded by a moderate winter. Water is the usual source of infestation. Affected animals should be separated from healthy ones, and all animals should be placed in dry pastures with pure water supply. Infected calves or sheep may be confined in a close shed and made to inhale chlorine gas or sulphur fumes. Good results have also been obtained in the treatment of calves by injecting between the rings of the trachea a mixture of equal parts of turpentine and sweet oil, to which a few drops of carbolic acid have been added.

Consult: *Ohio Experiment Station, Bulletin, No. 91; Arkansas Experiment Station, Bulletin, No. 35;* Hutyra and Marek, *Special Pathology and Therapeutics of the Diseases of Domestic Animals,* vol. ii (Chicago, 1912).

LUNGWORT, lŭng′wûrt′, or OAKLUNGS (*lung + wort,* AS. *wyrt,* Goth. *waurts,* OHG. *wurz,* Ger. *Wurz,* root plant; connected with Lat. *radix,* Gk. ῥάδαμνος, *rhadamnos,* bough), *Sticta pulmonaria.* A lichen with an olive-green, foliaceous, leathery spreading thallus (pale brown when dry), found on trunks of trees in mountainous regions in North America and European countries, sometimes almost entirely covering them. It has been used as a remedy for pulmonary diseases. When properly prepared it is commonly used as a light diet similar to Iceland moss. It yields a good brown dye. Its name is derived from the fancied resemblance of its corrugated spotted thallus to the lung. The name lungwort is also given to a genus of phanerogamous plants (Pulmonaria), of the family Boraginaceæ. The lungwort (*Pulmonaria officinalis*) common in some parts of Europe has ovate leaves and purple flowers, and was formerly employed in lung diseases, but is now used in the north of Europe only as a potherb. The name lungwort is also given sometimes to *Mertensia*, the best-known species of which is *Mertensia virginica*, Virginia cowslips or bluebells. Sea lungwort is *Mertensia maritima*. The golden lungwort is *Hieracium murorum*.

LUNI. See Luna.

LUNT, George (1803–85). An American poet and journalist, born in Newburyport, Mass. Lunt was graduated at Harvard in 1824, taught in the Newburyport High School, and was soon after admitted to the Essex bar (1827). He served in the State Legislature and in the Whig National Convention of 1848. President Taylor made him United States district attorney. Later he resumed the practice of law and edited for a time the Boston *Courier*. In later years he was a Democrat. He died in Boston. He wrote several volumes of poems and essays, none of which are now current.

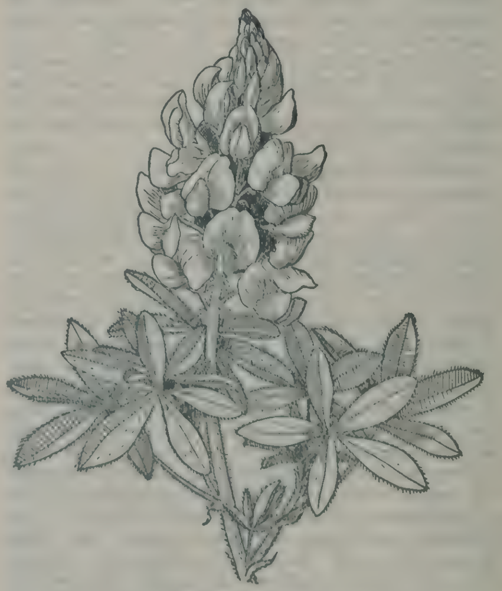
LUNT, Orrington (1815–97). An American philanthropist, born at Bowdoinham, Me. In 1842 he settled in Chicago, where he was for many years a commission merchant. From 1853 to 1859 he was water commissioner for the South Town of Chicago. During the Civil War he was so active as a member of the Committee of Safety and War Finance that his health was impaired and he had to spend 1865 and 1866 in Europe. Just before leaving he deeded to Northwestern University 157 acres of land near it. He was a trustee of Northwestern University from the granting of its charter in 1851 until his death; served as vice president and acting president of the board until he was made its president in 1895; and gave to the university the Orrington Lunt Library building. He was also prominently identified with Garrett Biblical Institute. The great fire of 1871 stripped him of many of his possessions. He was one of the members of the Relief and Aid Society of Chicago and also had charge of the distribution of the $150,000 collected by generous Methodists.

LU′PERCA′LIA (Lat. nom. pl., from *Lupercus*, name of a deity, which is explained by some as 'he who wards off wolves,' from *lupus*, wolf + *arcere*, to ward off. Others interpret *lupercus* as = 'wolf', and see in the Lupercalia a primitive worship of the wolf itself). A festival among the ancient Romans, held on February 15, in honor of Faunus (q.v.), an old Italian god of the herds and fertility. The Lupercal was a cave on the Palatine sacred to the god. (Consult Gilbert, *Geschichte und Topographie der Stadt Rom im Altertum*, i, 53–59: Leipzig, 1883.) In this cave, said the story, the she-wolf that suckled Romulus and Remus had its den. Yet in the Lupercalia Romulus and Remus had no place. The priesthood, known as the Luperci, formed two bands, one said to be restricted to the Quinctii of the Palatine, the other to the Fabii of the Quirinal. At the head of each was a chief, called *magister*. The god Lupercus seems to be purely an imaginary creation from a misinterpretation of the name of the festival. While the whole body of *pontifices* seem to have taken part in the festival, the chief rôle naturally fell to the Luperci. They sacrificed a goat and a dog, after which two young men were touched on the forehead with the bloody knife; the mark was then washed away with wool dipped in milk, upon which the youths were obliged to laugh aloud. The Luperci then, naked but for a goatskin about the loins, and holding in their hands strips of the skin of the slaughtered goat, ran in two bands around the foot of the Palatine, starting from the Lupercal, striking the women they met across the palm of the hand with the leathern thongs, a proceeding which was believed to produce fertility and a safe delivery. The thongs were called *februa*, and the festival was known as *februatio;* both words mean purification. From this ceremony the month February (*mensis Februarius*) derived its name. The whole ceremony is obviously a ceremony of purification and atonement to produce the increase of the community and of its herds. In 44 B.C. a third college of Luperci was established in honor of Julius Cæsar; of this Marc Antony was the first *magister:* Augustus rebuilt the Lupercal. The Lupercalia survived till 494 A.D. Consult W. W. Fowler, *Roman Festivals* (London, 1899), and Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

LUPER′CI. See Lupercalia.

LU′PIA, or **LU′PIÆ.** See Lecce.

LU′PINE (Lat. *lupinus*, *lupinum*, lupine, from *lupinus*, wolfish, from *lupus*, Gk. λύκος, *lykos*, Goth. *wulfs*, AS. *wulf*, Eng., OHG. *wolf*, Ger. *Wolf*, OChurch Slav. *vlŭkŭ*, Lith. *vilkas*, Skt. *vṛka*, wolf; connected with Skt. *vraśc*, to rend, Gk. ἕλκειν, *helkein*, OChurch Slav. *vlĕkati*, to haul), *Lupinus*. A genus of annual and perennial herbs and half shrubs of the family Leguminosæ, natives of the Mediterranean region and temperate North and South America, about 90 species being indigenous to the United States, principally to the Rocky Mountain and Pacific coast regions. Lupines were known to the ancient Greeks and Romans, who cultivated



LUPINE (*Lupinus subcarnosus*).

them for their seeds and for green manuring, for which and for ornamental purposes they are in general cultivation in temperate regions. They succeed best on light sandy loam soils, and usually fail on wet and calcareous soils or on sandy lands with a calcareous subsoil. They require no careful preparation of the soil. The most important species are the white lupine (*Lupinus albus*), the yellow lupine (*Lupinus luteus*), and the blue lupine (*Lupinus angustifolius*). The Texan species (*Lupinus subcarnosus*) also merits cultivation. All species are rich in nitrogenous matter, and when plowed under they enrich the soil in the same manner as clover and other leguminous plants.

On an average the fresh lupine forage has the following percentage composition: water, 85.4; protein, 2.8; fat, 0.3; nitrogen-free extract, 6.2; crude fibre, 4.6; ash, 0.7. The average percentage composition of lupine hay follows: water, 9.3; protein, 11.9; fat, 3.3; nitrogen-free extract, 40.3; crude fibre, 27.5; ash, 7.7. Lupine seeds are rich in protein, the yellow considerably more than the blue variety. Yellow lupine seeds have the following percentage composition: water, 14.0; protein, 38.2; fat, 4.4; nitrogen-free extract, 25.5; crude fibre, 14.1; and ash, 3.8. The seeds contain a bitter principle, said to be harmful to stock. They may be disembittered by repeated extraction with cold water. They are very digestible. Sheep will learn to eat the seed before the bitter principle is removed. The use of lupine is not common in the United States, but is widespread in many regions of Europe. Lupines are much cultivated for their beautiful flowers, both as a garden and a greenhouse plant.

LUPINO'SIS, also known as LATHYRISM, and CHICK-PEA DISEASE. A malady observed in France, Italy, Algiers, and India. It is characterized by gastrointestinal irritation, followed by weakness and spastic paralysis of the legs. The cause is assigned to the habitual use of meal prepared from the vetches, which is mixed with barley and wheat.

LUPOT, ly̧'pō', NICOLAS (1758–1824). The most famous of French violin makers, born at Stuttgart, where his father François, also a violin maker and reputed pupil of Guarnerius, lived for 12 years. He first followed his trade at Orléans, but removed to Paris in 1794. He became famous through the extraordinary skill with which he imitated the instruments of the greatest masters, notably those of Stradivarius, whence his appellation "The French Stradivari." His instruments command very high prices.

LUPRACHAUN. See LEPRECHAUN.

LUP'TON, THOMAS GOFF (1791–1873). An English mezzotint engraver, born at Clerkenwell, London. He was a pupil of George Clint, afterward assistant to S. W. Reynolds, and he was one of the first to employ steel in his art. The Society of Arts awarded him a medal in 1822 for the success of his experiments in engraving on soft steel. His plates are rich, brilliant, and delicate and without the hardness usually apparent in steel engraving. His best work was done in seas and landscapes, and Ruskin gave high praise to his reproductions of Turner's *Harbours of England* and Turner and Girtin's *River Scenery of England* (1827). For Turner he also made four of the *Liber Studiorum* plates, displaying so fine and delicate a touch that they were esteemed as among "the most famous works of engraving that exist." Notable also are his portraits after Lawrence, Reynolds, and others, especially "The Duke of Wellington on the Field of Waterloo," after Haydon.

LU'PULIN. A yellow, coarse powder, prepared from hops, and composed chiefly of the dried glands from the strobiles of the plant. It is known as *lupulinum* in the United States Pharmacopœia, and its oleoresin is an official preparation. Lupulin is given for its sedative effects on the general nervous system and, like hops, is a mild hypnotic. It is especially useful in irritable conditions of the genito-urinary organs. See HOPS.

LU'PUS (Lat., wolf). A skin disease, two distinct varieties of which are recognized, viz., *lupus erythematosus* and *lupus vulgaris.* The latter is a form of tuberculosis of the skin, characterized by the formation of reddish or brownish patches consisting of papules and nodules and terminating usually in ulceration, followed by scarring. The nodules are softer than the surrounding skin, in which they are apparently embedded. After a time the nodules increase in size, coalesce, and form reddish, elevated patches. If the nodules remain small and undergo no further evolution, the variety is termed *lupus maculosus;* when inflated and of considerable size, *lupus tumidus;* when shrunken and replaced by cicatrices, *lupus exfoliativus;* when the nodules are scattered about in disorder, *lupus disseminatus;* when they break down and ulcerate, *lupus exulcerans.* The ulcers are not painful, but they follow the lymph channels and spread, tissue of all kinds, including muscle, cartilage, and bone, being involved in the destructive process. Lupus of the face sometimes results in the loss of all or part of the nose (a favorite starting point of the disease), the lips, the ears, and the cheeks. Frightful disfigurement results, and after the process has been checked extensive plastic operations are necessary to restore the patient to an endurable condition. Next to the face, the extremities are the most common seat of lupus, especially the forearms and legs. The mucous membranes may be attacked extensively.

Lupus vulgaris is distinguished from *lupus erythematosus* by the fact that it develops in childhood or youth, that it is deep-seated, and that ulceration and scarring nearly always occur; whereas the erythematous form develops in adult life, is superficial, and ulceration never occurs. *Lupus erythematosus* when fully developed appears as one or more sharply defined reddish or violet-colored patches, varying in size from a small coin to the palm of the hand, the surface of which is covered by grayish or yellowish scales. The symptoms are chiefly confined to itching and burning. In mild cases local treatment consists in the application of sulphur or other moderately stimulating ointments or plasters. When these remedies fail, and the disease is severe and of long standing, cauterization with nitrate of silver, liquor potassæ or trichloracetic acid, or even scarification and superficial curetting are employed. Internal remedies are of little avail. Some cases recover spontaneously. The treatment of *lupus vulgaris* is much more vigorous. The affection being tuberculous, Koch's tuberculin, when cautiously used, has a beneficial effect. The best local treatment appears to be some form of phototherapy. Finsen's light, the X ray (q.v.), and prolonged exposure to the sun's rays are all followed by excellent results. Where the ulceration is extensive, curetting, scarification, and excision are required. The usual prophylaxis against tubercle infection must be rigidly observed. A nutritious diet, fresh air, exercise, and the internal administration of such remedies as cod-liver oil and iodide of iron, help materially in the cure. See Blastomycosis.

LUR, lo͞or (Swed., Norw., Dan., trumpet, from Icel. *lúdr*, hollowed piece of wood). An instrument made from two slender, hollow pieces of wood, put together so as to form a tube, and wound with birch bark. It is used by the shepherds of Scandinavia as the alpenhorn is used in Switzerland. The lur was for centuries used in war. Heimdal's Gjallarhorn was also called lụr. Recently some bronze lurs of great antiquity have been unearthed in Sweden and Denmark. These specimens vary in length from 5 to 7½ feet, and the long, slender tube bends around in a double curve.

LURAY, lû-rā′. A town and the county seat of Page Co., Va., 110 miles west by south of Washington, D. C., on the Norfolk and Western Railroad (Map: Virginia, F 3). Among the industrial establishments are a large tannery, flour mills, carriage and wagon shops, canneries, and woodworking plants. Luray is picturesquely situated in the Page valley, with fine views of the adjacent mountains, and is a popular resort, widely known because of the Luray Cave (q.v.). Mineral springs abound in the vicinity. The town owns its water works. Pop., 1900, 1147; 1910, 1218.

LURAY CAVE. A cave in Page Co., Va., in the limestone formation of the Shenandoah valley, a short distance west of the village of Luray, on the Norfolk and Western Railroad. The cavern was discovered in August, 1878, by Andrew J. Campbell and others. It underlies an area of about 100 acres and consists of innumerable chambers, only a few of which have been explored. There are several tiers of galleries, the vertical depth of which, from the highest to the lowest, is about 260 feet. Although small in comparison with the Mammoth Cave of Kentucky, it is remarkable for the great number and beauty of the stalactites. The cave is lighted with electric lights, and attracts thousands of visitors annually.

LURCH′ER (from *lurch*, assibilated form of *lurk*, from Swed. *lurka*, *lirka*, to lie hid, from *lura*, to lurk, Icel. *lūra*, to slumber, Ger. *lauern*, to lurk). A kind of dog, somewhat resembling a greyhound, and derived from a greyhound crossed with the shepherd's dog. It is lower, stouter, and less elegant than the greyhound, almost rivals it in fleetness and eyesight, and much excels it in scent. It is covered with rough, wiry hair, is usually of a sandy red color, although sometimes black or gray, and has half-erect ears and a pendent tail. It is the poacher's favorite dog, as it possesses all the qualities requisite for his purposes; in sagacity it rivals the most admired dogs, and it learns to act on the least hint or sign from its master. When this dog is crossed with any other breed the product is technically a cur. English literature, from Milton onward, abounds in references to the lurcher.

LURGAN, lûr′gan. A town in County Armagh, Ireland, 20 miles southwest of Belfast and 2 miles from Lough Neagh (Map: Ireland, E 2). It has flourishing linen manufactures of cambrics, damasks, lawns, etc., and an important weekly market of agricultural produce. It contains Lurgan Castle, a handsome Elizabethan mansion standing in a well-wooded park, the seat of Lord Lurgan. The United States is represented by a consular agent. Pop., 1901, 11,777; 1911, 12,553.

LURIA, lo͞o′rê-ȧ, Isaac ben Solomon Ashkenazi (1534–72). A Hebrew mystic. He was born at Jerusalem and was carefully educated in the rabbinical literature. About 1556 he made a thorough study of the *Zohar* (see Cabbala), and this led him to adopt the life of a hermit, living in an isolated cottage on the Nile. Removing to Safed in 1566, he became the centre of the Cabbalistic circle there, and soon acquired a great reputation as a teacher and as a worker of miracles. His Cabbalistic system was made known largely through the efforts of Ḥayyim Vital, who collected all the notes of Luria's lectures made by his disciples, and who from this material produced numerous works, of which the most important was *Eẓ Ḥayyim* (6 vols., 1784).

LURIA, R. de. See Lauria, R. de.

LURIS, lo͞o′rēz. The people after whom Luristan, a mountainous region in western Persia, bordering on Turkey, has been named. They belong to the same Iranian stock as the rest of the Persians, but are looked upon by some authorities as presenting a very pure racial type. They are divided into the Great Luris (or Bakhtyari) in the east and the Little Luris (or Feili) in the west. Consult: Dieulafoy, *La Perse, la Chaldée et la Susiane* (Paris, 1887); Layard, *Early Adventures in Persia, Susiana, and Babylonia* (London, 1887); Houssaye, *Les races humaines de la Perse* (Lyons, 1888); De Morgan, *Mission scientifique en Perse* (Paris, 1894–97).

LURISTAN, lo͞o′rĭs-tăn′. A region of Persia. See Luris.

LURLEI, lụr′lī. A cliff on the Rhine. See Lorelei.

LURTON, Horace Harmon (1844–1914). An American jurist, born at Newport, Ky. He was attending school in Chicago at the outbreak of the Civil War and left to volunteer in the Confederate army. Despite his youth, he soon won promotion to rank as an officer, becoming a major at the age of 18. He participated in the Morgan raid into Ohio, and was captured and imprisoned. When the war ended he entered Cumberland University at Chattanooga, Tenn., graduating in 1867. His rise to distinction in the practice of the law in the Tennessee courts was rapid. As chancellor of the sixth division from 1875 to 1878, as associate justice of the supreme court of Tennessee from 1886 to 1893, and as Chief Justice of this court during a part of 1893, he became widely known for his profound knowledge of both criminal and corporation law; his opinions were said to have been quoted oftener than those of any other Tennessee judge. In 1893 Lurton was appointed by President Cleveland Federal judge of the Sixth Judicial Circuit of the United States. In this connection his service was equally distinguished. He and William H. Taft, then judge on the same circuit, became warm friends. Invited by Vanderbilt University (1898) to become professor of constitutional law, Justice Lurton held this chair until 1910, serving also as dean of the law department from 1905 to 1910. In the latter year, despite his advanced age, he was appointed by President Taft associate justice of the United States Supreme Court. Although all acknowledged Lurton's ability, he was considered by some to have shown bias in favor of railroad and corporation interests, and it was generally expected that he would endeavor to maintain the traditional or conservative interpretation of the Constitution—a view which he had indorsed in his writings. His elevation, however, was considered a victory for nonsectionalism.

LUSA′TIA, Ger. **LAUSITZ,** lou′zĭts. A district in Germany between the Elbe and the Oder, consisting of Upper and Lower Lusatia. The former is now divided between the Kingdom of Saxony and the Prussian Province of Silesia, while the latter forms a part of the Prussian Province of Brandenburg. Lusatia has its name from the Slavic tribe who were settled here, and who were conquered by the Germans in the tenth century. After belonging for a time to Brandenburg, the whole of Lusatia became in the fourteenth century a possession of the crown of Bohemia. By the Peace of Prague, in 1635, the territory passed to Saxony, which had to cede a large part of it to Prussia in 1815 by the Treaty of Vienna. See WENDS.

LUSCHKA'S (lụsh′kȧz) **TONSIL.** See ADENOID.

LUSHAIS, lo͞o-shīz′. The natives of the Lushai Hills in the Cacher District of Assam, part of the Chittagong hill region in Bengal, and the adjacent Burmese territory. By language they are related to the Thai (Siamese, Burmese, etc.) stock. The Lushais proper are described as rather slenderly built and brown-skinned, with prominent cheek bones and flat nose. They had the reputation of being very warlike, and had conquered the smaller tribes of their habitat. Previous to their pacification in 1888 by the British they were looked upon as head-hunting savages, but in 1900 it became evident that this view was entirely erroneous. The language of the Lushais was reduced to writing in a modified Roman alphabet by the missionaries in 1894–97. In 1898 a grammar and dictionary were published, and since then some readers, containing extracts from the Bible, folklore items, and the like. The Lushais south of Manipur are considered by some scholars to be Nagas mixed with Kyens and Burmese of Arakan. Consult: Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872); C. A. Soppit, *Short Account of the Kuki-Lushai Tribes on the Northeast Frontier* (Shilling, 1887); Reid, *Chin-Lushai Land* (Calcutta, 1893); Lorrain and Savidge, *Grammar and Dictionary of the Lushai Language* (Assam, 1898). See INDO-CHINESE.

LUSHINGTON, lŭsh′ĭng-ton, STEPHEN (1782–1873). An English jurist. He was born in London, was educated at Oxford, and was called to the bar in 1806. From 1806 to 1841 he was a member of Parliament. He was a follower of Fox and Grenville, in 1817 was counsel for Lady Byron, and in 1820, in conjunction with Lords Denham and Brougham, was of counsel for Queen Caroline. In 1828 he was appointed a judge of the Consistory Court, in 1838 judge of the Admiralty Court, and in the latter year was sworn in the Privy Council. He was regarded as an authority on ecclesiastical law and left some important works in this field.

LÜ-SHUN-K'OW. A naval station in China. See PORT ARTHUR.

LU′SIAD, THE. An historical epic, dealing with events in the history of Portugal. See CAMÕES.

LUSIGNAN, lu′zē′nyäɴ′. A noble French family of the age of the Crusades, the most celebrated member of which was Guy of Lusignan (q.v.).

LU′SITA′NIA. A district of ancient Hispania (q.v.), which, as the country occupied by the Lusitani, was, according to Strabo, bounded on the south by the Tagus, and on the north and the west by the ocean (Map: Rome, B 3). Its extent afterward was contracted by the growing importance of the Callæci, and the river Durius (Douro) became its northern boundary. Afterward, since many of the Lusitanians were driven southward in their long struggles with the Romans, the name Lusitania was given to the district south of the Tagus. When Augustus divided Hispania into three provinces, Bætica, Tarraconensis, and Lusitania, the last occupied the southwest, between the Anas (Guadiana) on the east, the sea on the south and west, and the Durius on the north. It comprised the greater part of the modern Kingdom of Portugal, besides a large portion of León and the Spanish Estremadura. Some of the principal towns were Metellinum (Medellin); Emerita Augustus (Mérida), the Roman capital, on the Anas; Olisipo (Lisbon), the capital before the time of the Romans; Conimbriga (Coimbra), on the Munda; Salmantica (Salamanca); Pax Julia (Beja); Ebora (Evora). The province was anciently rich and fertile and had valuable mines of gold and silver. The Lusitani were a wild and warlike people, much addicted to plunder, especially those living in the mountains, and were accounted the bravest of all the Iberians. The Romans successfully invaded their territory in the early part of the second century B.C. In 153 B.C. they revolted and for 14 years fought against the Romans, who for a time acknowledged their independence. Viriathus, their chief, defeated several Roman generals. At length the consul Cæpio, unable to subdue him in the field, captured him by the treachery of his friends, and put him to death (about 140 B.C.), soon after which the Lusitanians were finally subdued. Consult: S. A. Dunham, *History of Spain and Portugal* (5 vols., London, 1832–33); Alexandre Herculano, *Historia de Portugal* (4 vols., Lisbon, 1848–63); Oswald Crawfurd, *Portugal Old and New* (London, 1880); H. M. Stephens, *Story of Portugal*, in "Story of the Nations Series" (New York, 1893). See SPAIN, *History.*

LUSITANIA. A vessel owned by the Cunard line and one of the largest and fastest of the transatlantic liners, sunk by a German submarine on May 7, 1915. She was torpedoed 10 miles off Kinsale Head, Ireland, and sank in less than 20 minutes. Eleven hundred and fifty persons lost their lives, among whom were 114 citizens of the United States. The latter included Alfred G. Vanderbilt, Elbert Hubbard, Charles Frohman, and Justus Miles Forman (qq.v.).

LUSK, GRAHAM (1866–). An American physiologist. He was born at Bridgeport, Conn., and graduated from Columbia University in 1887 and from the University of Munich (Ph.D.) in 1891. He was instructor in physiology (1891–92), assistant professor (1892–95), and professor (1895–98) at Yale University; and served as professor of physiology at the University and Bellevue Hospital Medical College from 1898 to 1909, when he assumed the same duties at the Cornell University Medical

College. He became also director of the Russell Sage Institute of Pathology. He is author of *Elements of the Science of Nutrition* (1906; 2d ed., 1909) and *The Fundamental Basis of Nutrition* (1914).

LUSK, William Thompson (1838–97). An American obstetrician, born at Norwich, Conn. He was a student at Yale College (1859–60), then studied medicine at Heidelberg and Berlin (1860–61), served in the Union army during the Civil War (1861–63), and graduated at the Bellevue Hospital Medical College in 1864. He then pursued his studies in Edinburgh, Paris, Vienna, and Prague. Returning to New York in 1865, he began practice and rose rapidly in his profession. He was made professor of physiology at the Long Island College Hospital in 1868, lectured on physiology at the Harvard Medical School in 1870, and was professor of obstetrics and diseases of women in Bellevue Hospital Medical College from 1871 till his death. He was coeditor of the *New York Medical Journal* from 1871 to 1873. His book on *The Science and Art of Midwifery* (New York, 1882) has passed through several editions and has been translated into several foreign languages.

LUSSAN, lụ'säɴ', Zélie de (1863–). An American dramatic soprano, born in New York of French parents. Her mother was a brilliant vocalist, and the daughter early began the study of music, making her first public appearance when nine years old. She sang at Wagner festivals, then joined the Boston Ideal Opera Company and made her operatic début in 1886 as Arline in Balfe's *Bohemian Girl*. In 1889 she went to London, where she was enthusiastically received, and joined the Carl Rosa Opera Troupe. In 1894 she appeared at the Metropolitan Opera House, New York; in 1895 and 1896 she sang in Spain, Portugal, and France; in 1897 and 1899 she again visited the United States and in 1902 made a concert tour of that country. Her most successful rôles include Carmen (rendered over 600 times); Mignon; Musette, in *La Bohême;* Zerlina, in *Don Giovanni;* Marie, in *La fille du régiment;* and Marguerite, in Berlioz's *Damnation de Faust*. In 1908 she left the operatic for the vaudeville stage.

LUSSIN, lụs-sēn', or **LOSSINI,** lŏs-sē'nė. A small island in the Adriatic, situated near the entrance to the Gulf of Quarnero. It belongs to the Austrian Crownland of Istria (Map: Austria-Hungary, D 4). Area, 29 square miles. Pop., about 15,000, consisting chiefly of Italians and Croats. The inhabitants are engaged in agriculture, seafaring, shipbuilding, and fishing. The chief town, Lussin Piccolo, is a favorite winter resort, has a good harbor, a Venetian palace, and a nautical school. Pop., 1900, 7207.

LUSTIGEN WEIBER VON WINDSOR, lụs'tĭ-gen vī'bĕr fôn wĭn'zēr, Die (Ger., The Merry Wives of Windsor). An opera by Nicolai (q.v.), first produced in Berlin, March 9, 1849; in the United States, April 27, 1863 (New York).

LUSTRA'TION (Lat. *lustratio*, from *lustrare,* to purify, from *lustrum*, purificatory sacrifice, from *luere,* Gk. λούειν, *louein*, to wash. Cf. Lat. *lavere*, to wash). An ancient ceremony, both Greek and Roman, taking many forms, the object of which was to establish or reëstablish those friendly relations with the gods upon which the prosperity of the community depended. This might be accomplished by purification by various means, which would remove any defilement, or by leading the sacrificial victim around the object to be purified and thus symbolically shutting out impurity. The purification was accomplished by fire, water (especially salt water), sulphur, or other fumes, or by the sacrifice of an animal. Among the Greeks the animal used was the pig. In the Lupercalia (q.v.) the Romans employed a goat; elsewhere they used the *suovetaurilia.* (See below.) These ideas appear prominently at many of the Roman festivals, such as the Palilia or Parilia, when the herds and the people were purified, or the Amburbium or Ambarvalia (q.v.), when the victims were led around the city or the fields, and still more at the purification of the assembled people on the Campus Martius at the close of the census (q.v.) taken, in theory, every five years. At this lustrum, the *suovetaurilia,* or the boar (*sus*), sheep (*ovis*), and bull (*taurus*), offered for sacrifice, were led solemnly around the gathering and then sacrificed, with a vow of a similar offering if prosperity were granted the community for the ensuing five years. It may be noted that the term "lustrum" came to denote the whole period between these lustrations. (See also Lupercalia.) Not only were these state purifications usual at regular seasons, but any prodigy indicating the displeasure of the gods called for lustrations, often on a very elaborate scale. Moreover, many of the acts of daily life, especially those connected with marriage, birth, and death, called for purificatory rites, not only among the more formal Romans, but also among the Greeks. The Romans purified the army and the fleet before they set out on an expedition. Consult: Otto Gruppe, *Griechische Mythologie und Religionsgeschichte,* vol. ii (Munich, 1897); Paul Stengel, *Die griechischen Kultusaltertümer* (2d ed., ib., 1898); W. W. Fowler, *Roman Festivals* (London, 1899); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

LUSTRE MOTTLING. See Diabase.

LUS'TRUM. See Lustration.

LUTE (OF. *lut, leut,* Fr. *luth,* from Sp. *laúd,* Portug. *alaude,* lute, from Ar. *al‘ūd,* the lute, from *al,* the, and *‘ūd,* lute wood). An obsolete stringed musical instrument, which has been superseded by the harp and guitar. It consisted of a table of fir; a body, or belly, shaped like the back of a mandolin; a neck, or finger board, of hard wood, on which were 9 (or 10) frets, stops, or divisions, marked with catgut strings; a head, or cross, on which were placed the pegs or screws that tightened or relaxed the strings in tuning; and a bridge, to which the strings were attached at one end, the other end being fastened to a piece of ivory, between the head and neck. The strings varied in number, from 6 to 13, all of them, except the highest or melody string, being doubled. The performer used his left hand to press the stops and struck the strings with his right. A peculiar description of notation, called *tablature,* was employed in music written for the lute. The lute is one of the oldest of musical instruments, as representations of it are found on ancient Egyptian monuments. Very likely the Persians adopted the lute from the Egyptians about the fourth century B.C. From the Persians it passed to the Arabs, with whom it soon became the chief instrument. During the supremacy of the Saracens the lute was introduced into Spain and

Lower Italy, whence it found its way into all European countries during the fourteenth century. From that time on until the end of the seventeenth century the lute was the principal instrument, occupying a position very similar to that of the modern piano. It was also one of the chief instruments in the orchestra. Beginning with the eighteenth century, the lute was gradually superseded by the violin in the orchestra and by the clavichord as a general instrument. In the early operas the lute was used to accompany the recitatives. Consult J. W. von Wasielewski, *Geschichte der Instrumentalmusik im 16ten Jahrhundert* (Berlin, 1878), and Albert Jacquot, *La lutherie lorraine et française depuis ses origines jusqu' à nos jours* (Paris, 1912). See TABLATURE, and for Illustration see MUSICAL INSTRUMENTS.

LUTE (OF., Fr. *lut*, clay, lute, from Lat. *lutum*, mud, from *luere*, Gk. λούειν, *louein*, to wash). A pasty cement that is used for sealing the joints of apparatus so as to prevent the escape of vapors or gases, or for coating glass vessels in order to render them capable of sustaining a high temperature. The lutes commonly used consist of common plastic clay or pipe clay, made into a pasty mass by the addition of linseed meal or almond powder. Such material will stand a temperature of 260° C. (500° F.); while for more delicate work fat lutes, consisting of powdered dry clay mixed with a drying oil or glycerin to a thick paste, are used. Consult *Scientific American Cyclopædia of Receipts, Notes and Queries* (New York, 1901), and Spon, *Workshop Receipts* (ib., 1909–10). See CEMENT.

LUTERO, lo͞o-tä′rô, BATTISTA DI VICCOLO. An Italian painter. See DOSSO DOSSI.

LÜTGERT, lụt′gĕrt, WILHELM (1867–). A German Lutheran theologian, born at Heiligengrabe. He served as a lecturer (1892–95) and professor (1895–1901) at Greifswald and was then called to Halle, where he was professor extraordinary in 1901, became full professor of New Testament history in 1902 (succeeding Beyschlag), and in 1913 was transferred to the chair of systematic theology as successor of Martin Kähler. His writings include: *Die Methode des dogmatischen Beweises in ihrer Entwickelung unter dem Einfluss Schleiermachers* (1892); *Das Reich Gottes nach den synoptischen Evangelien* (1895); *Die johanneische Christologie* (1899); *Die Erschütterung des Optimismus durch das Erdbeben von Lissabon 1775* (1901); *Die Anbetung Jesu* (1904); *Die Liebe im Neue Testament* (1905); *Gottes Sohn und Gottes Geist* (1905); *Im Dienste Gottes* (1907); *Freiheitspredigt und Schwarmgeister in Korinth* (1908); *Die Vollkommenen im Philipperbrief und die Enthusiasten in Thessalonich* (1909); *Natur und Geist Gottes* (1910); *Amt und Geist im Kampf* (1912).

LUTH, lụt. A sea turtle. See LEATHERBACK.

LUTHARDT, lo͞ot′härt, CHRISTOPH ERNST (1823–1902). A German Lutheran theologian, born at Maroldsweisach and educated at Erlangen and Berlin. After lecturing two years at Marburg he went in 1856 to Leipzig as professor of systematic theology and New Testament exegesis. His theological works were varied and many; their tone was that of the Erlangen school. Luthardt was a prominent churchman and leader of the modern orthodox party. He founded and edited the *Allgemeine evangelisch-lutherische Kirchenzeitung* (1869–80), the *Theologisches Litteraturblatt* (1880 et seq.), and the *Zeitschrift für christliche Wissenschaft und christliches Leben* (1880–89), and wrote: *Das johanneische Evangelium* (1852; 2d ed., 1875–76); *Kompendium der Dogmatik* (1865; 9th ed., 1893); *Apologie des Christentums* (1864 and after); *Geschichte der christlichen Ethik* (1888); and contributions to Strack and Zöckler's *Kommentare* on the Gospel of John (1886), the Epistle to the Romans (1887), and the Johannine Epistles (1888). The second edition of his autobiography appeared in 1891.

LU′THER, MARTIN (1483–1546). The founder of Protestant Christianity, born at Eisleben, in the heart of Germany, Nov. 10, 1483. His father, Hans, a poor miner, and his mother, Margaret, did not spare the rod in bringing up their large family. Amid the privations of poverty, the brutalities of his first schoolmasters, and superstitious terrors of the devil and of witches, the boy's life was far from happy. At the age of 13 he was sent to Magdeburg to school, and then for four years to Eisenach, at both of which places he, like other poor students, helped support himself by begging. In the autumn of 1501 he matriculated at the University of Erfurt. Ranking among the better scholars, he took his bachelor's degree in 1502 and that of master three years later.

He had just begun the study of jurisprudence, when the course of his life was suddenly altered. An epidemic of the plague swept over Germany, killing two of his brothers and forcing the university to close. As he was returning to it from home, on July 2, 1505, he was overtaken by a thunderstorm, which frightened him into making the vow to St. Anna to become a monk. Two weeks later he fulfilled this promise by entering the Augustinian friary at Erfurt. After a year's novitiate he took the irrevocable vows of poverty, chastity, and obedience; in 1507 he was ordained priest. In 1508 he was called to teach philosophy at the new University of Wittenberg. Returning to Erfurt, he continued to lecture on theology. A pilgrimage to Rome on business of the order in the winter of 1510–11 gave him an unfavorable impression of conditions in the capital of Christendom. In 1511 he was again called to Wittenberg as professor of biblical exegesis, a position he held the rest of his life.

His inner experiences during the first 10 years in the friary are of more interest than his public actions. He began with the conviction of sin, and the horrible belief that he was predestined to an eternity in hell. He learned, both from the practice of the Church and from the theologians, that a man must win salvation by "good works," chief of which was reckoned the monastic life, with its prayers, its hardships, and its penances. He also believed that concupiscence was the greatest of sins and was original sin itself. Finding that none of his efforts, strenuous though these were, could rid him of natural desire nor give him assurance of God's grace, he concluded that the will was impotent, and that no human actions whatever could suffice to merit divine favor. The worthlessness of "good works" was impressed upon him by a sharp quarrel with some members of his order who laid most stress upon the regulations of the cloister. He kept asking himself "How can I win a gracious God?" and the answer, suggested partly by the counsels of his superior, John von Staupitz, and partly by the writings of the German mystics and of St. Paul, came to him about 1515 with such force that he believed it to be a direct revelation of the Holy Ghost. It dawned on him that, if man could do nothing, all must be left to God. Pure passivity in his hands, complete self-abandonment, constituted that "faith," justification by which has ever since been counted the cardinal doctrine of Protestants.

The effect of his discovery was instantaneous. Not only did it become the burden of his lectures on Romans (1515–16) and Galatians (1517–19), but it stimulated him to purge his order and his university, as far as lay in his power, of some of the older doctrine and practices. He soon found himself obliged to protest against what he deemed a flagrant abuse.

Among the "good works" recommended to Christians at that time, one of the most obtrusive was the purchase of indulgences or papal remissions of the penalties of sin, including both penances in this life and the pains of purgatory. An indulgence proclaimed by Pope Leo X in 1515 was taken up by Albert, Archbishop of Mainz, and exploited extensively. His chief agent was a Dominican named John Tetzel, who traveled through Germany proclaiming that for a payment of money remission of the temporal punishment due to sin could be obtained. Nor were these benefits limited to the living; the souls of the dead were released from purgatory as soon as indulgences applicable to those souls were gained for them by their friends. Many men were opposed to this procedure, but no effectual protest was made, until, on Oct. 31, 1517, Martin Luther posted on the doors of the principal church at Wittenberg 95 theses calling in question the value of indulgences, and particularly arraigning the practices of the agents employed to sell them. The *Theses*, written in Latin, were translated into German and published without Luther's knowledge. They spread like wildfire over Germany, in many quarters applauded to the echo, and awakened vehement opposition to the indulgences in question.

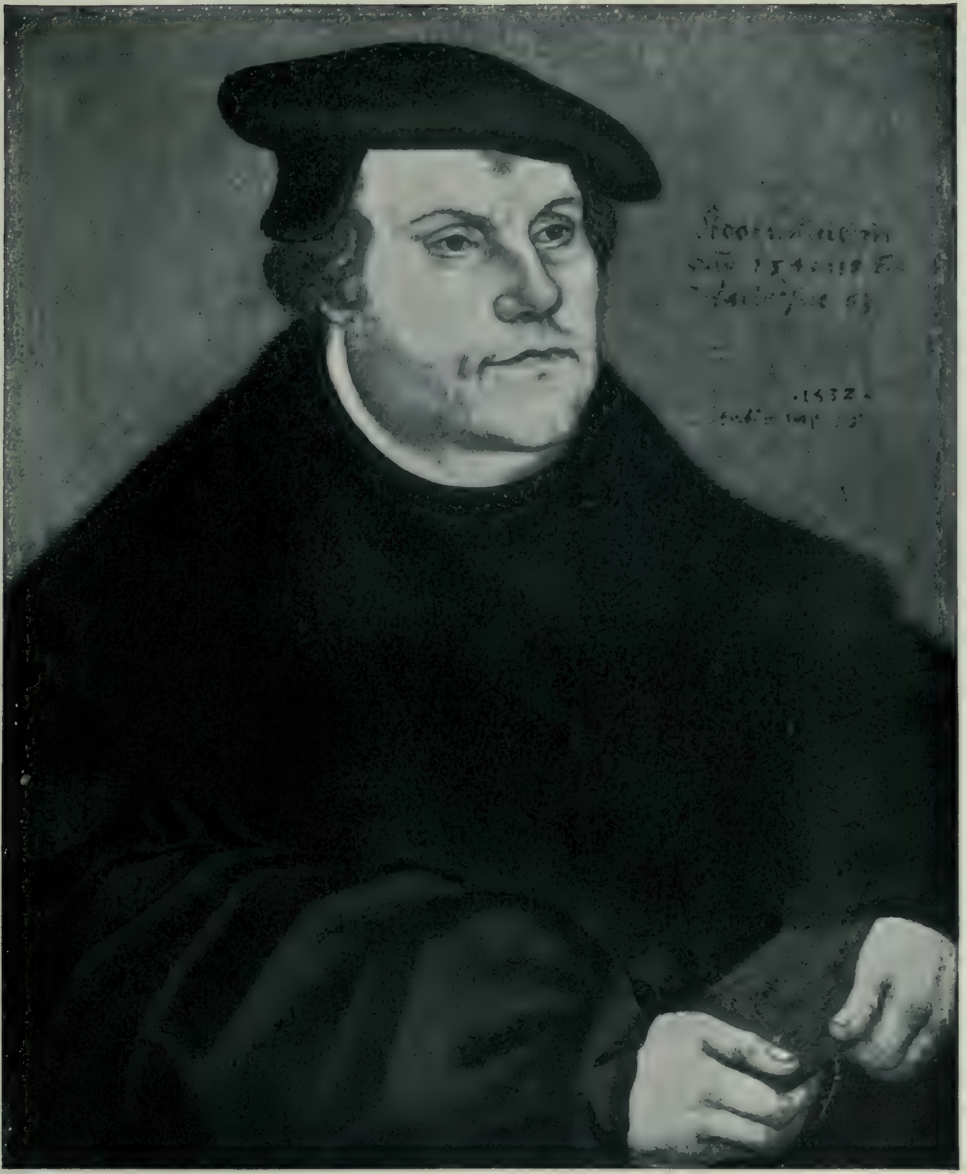
The Church, always sensitive to attacks on her power and revenues, lost no time in acting. As early as February, 1518, the Pope ordered the general of the Augustinians to make the presumptuous friar recant. At a general chapter of the order held at Heidelberg in May, Luther was present, but, far from recanting, defended his position in a public debate. He was accordingly summoned to appear before the Cardinal Legate Cajetan at Augsburg to answer for his heresy. He did so in October, but again refused, in a stormy interview, to retract aught that he had said. Shortly afterward he appealed from the Pope to a general council of the Church, a new offense in the eyes of the curia. Cajetan was instructed to seize him and send him to Rome, a project foiled by Luther's sovereign, Elector Frederick III of Saxony, who secured for him a safe-conduct from the Emperor Maximilian.

Failing in force, the Church resorted to milder means. Charles von Miltitz was sent as special nuncio to Saxony, with instructions to persuade Brother Martin to keep quiet, or else to cajole the Elector into suppressing him. A meeting between Miltitz and Luther early in January, 1519, failed to accomplish anything.

In July a still wider publicity was given to the whole affair by a debate held at Leipzig between Luther and his colleague Carlstadt on one side, and the celebrated Catholic theologian John Eck on the other. Starting from the question of indulgences, the debate soon came to turn on the power of the Pope to grant them, and from that to the authority of the Roman see in general. Luther denied the supremacy of the Bishop of Rome, which he considered a usurpation about four centuries old, and he further denied that churches not in communion with Rome were for that reason schismatic. It was for this doctrine that John Huss had been condemned by the Council of Constance in 1415; Luther asserted that the council had erred in doing this, and that many of the positions of Huss condemned as heresy were in reality "most Christian and evangelic." His words sent a thrill throughout Christendom. He had first appealed from indulgence seller to Pope, then from Pope to council; he now declared a council could err and appealed from it to the Bible as interpreted by his own reason. It was a clear issue, though hardly recognized as such by himself, between the religion of authority and the religion of private judgment.

The Wittenberg professor continued to develop his ideas in a series of remarkable publications. The success of his movement was due in large measure to the recent invention of printing. The press, as an organ for appealing to and molding public opinion, has never been more thoroughly exploited than it was by the reformer. In 1520 three pamphlets, in many respects his most powerful works, set forth the programme of the Reformation. In the first, *An Address to the Christian Nobility of the German Nation*, he called on the secular powers to reform, by force if necessary, the abuses in the Church. Elsewhere he proclaimed that the Pope was Antichrist and summoned his countrymen to march on Rome and wash their hands in the blood of the old religionists. In his second pamphlet, *The Babylonian Captivity of the Church*, he attacked the sacramental system and reduced the number of sacraments from seven to two. The third, *The Liberty of a Christian Man*, a devotional treatise, sets forth a mystical ideal of indifference to the world.

In the meantime a papal commission, headed by John Eck, drew up the bull *Exsurge Domine*, condemning Luther and threatening excommunication and all the penalties of heresy. This was signed by Leo on June 15, 1520, was taken by Eck to Germany, and published there in September. Far from being intimidated, Luther burned it, together with the whole Canon Law and other books supporting the papal declarations, at Wittenberg, on December 10. The curia continued to use every means to secure the bold friar's condemnation by the secular authorities. The death of Maximilian on Jan. 12, 1519, necessitated a new Imperial election. Leo at first promised Frederick of Saxony his support in gaining the crown, in exchange for the surrender of his obnoxious subject. The wise Prince refused and threw his influence to Charles, of Spain, who was duly elected in June, 1519. Charles V, as he was now called, did not come to Germany to be crowned until the autumn of 1520. The machinations of the Papal Nuncio, Aleander, were foiled by Frederick, who stipulated that before being condemned Luther should be heard by the Imperial Diet about to be opened at Worms. The Wittenberg professor was accordingly summoned, and appeared before



MARTIN LUTHER

FROM A PORTRAIT BY LUCAS CRANACH IN THE ROYAL GALLERY, DRESDEN

this august body on April 17 and 18, 1521. Asked to recant, he refused in the memorable oration of which the closing words are traditionally, though perhaps not quite accurately, reported: "Here I stand. I cannot do otherwise. God help me. Amen."

Acting under pressure from the Emperor, and doubtless contrary to the wishes of most of the members, the Diet passed the Edict of Worms, putting Luther under the ban of the Empire. The legates urged Charles to seize Luther at once, in violation of the safe-conduct; but the young ruler was true to his word and allowed the condemned man to depart in safety. Frederick of Saxony, seeing that it would be unsafe to protect Luther openly, secretly sent him to one of his castles, the Wartburg. Here the reformer remained nearly a year in hiding, doing important literary work; here he wrote his treatise *On Monastic Vows*, proclaiming that they were invalid and wrong and urging monks and nuns to leave their cloisters; here also he made his translation of the New Testament from the Greek text published by Erasmus. In later years he added to this the Old Testament, and the work as a whole is justly ranked high as a scholarly achievement and still higher as a stylistic masterpiece. It was not, indeed, the first German version, but as it far surpassed all others not only in its intrinsic excellence, but also in the hold it took on the people, it marks a real epoch in German life and literature.

Luther returned to Wittenberg in March, 1522, in order to quiet some disturbances caused by the arrival in that town of three Anabaptists, who proclaimed themselves prophets and urged a much more radical reform than that of Luther. He had little difficulty in restoring order and forthwith set about the arduous task of organizing his new church. He altered the services in accordance with his new ideas of the sacraments and substituted German for Latin. He also framed a new system of Church government, in which the highest authority was the civil ruler. His famous catechisms (1529) furnished religious instruction to the people. Of the hymns he wrote, the greatest, "A mighty fortress is our God," has ever been the battle song of the Evangelical church.

Owing partly to dissatisfaction with the conditions of the old Church, partly to a growing discontent with her ascetic ideal, and partly to other causes, such as the rise of nationalism and individualism, the spread of the revolt from Rome was rapid during the lifetime of its leader, most of the states of Germany and some foreign nations ranging themselves under his banner. The most serious menace to the new cause came in 1525 with the insurrection of the German peasants. A class war, motived by economic conditions, it was nevertheless believed to be largely the result of the religious movement. The leaders themselves appealed to Luther, who approved of some of their demands, while condemning others, such as the request of the serfs to be freed. He soon became alienated by the excesses of the rebels and wrote an invective against them, urging the upper classes "to stab, smite, and slay" those "enemies of God" as in a crusade. The rebellion was, in fact, put down with ruthless slaughter, for which Luther cannot be held entirely guiltless.

Another scandal to the new church was the bigamy of its ablest political champion, Philip, Landgrave of Hesse. As Luther had stated in 1520 that he preferred polygamy to divorce, on the ground that the former was not forbidden by the New Testament as was the latter, and as in 1531 he had advised Henry VIII of England to take a second wife rather than put away Catharine of Aragon, Philip naturally turned to him for approval of his own bigamous marriage. A dispensation for this was signed by Luther and Melanchthon on Dec. 10, 1539, accompanied, however, by a strong recommendation to keep the matter secret. Luther even advised Philip, "for the sake and good of the Christian Church, to tell a good, strong lie"—a practice which in a pious cause he claimed was sanctioned by the example of Christ.

The tendency of Protestantism to divide into many bodies showed itself in the first years of its existence. It is remarkable that Luther should have regarded other reformed sects with a hatred more malignant, if possible, than that with which he visited the Catholics. The greatest of his rivals was Ulrich Zwingli, who differed from him in regarding the Eucharist as a simple memorial service, whereas Luther insisted on the real presence of the body and blood of Christ in the bread and wine; his doctrine, called consubstantiation, in fact closely resembled the transubstantiation of the Roman church. An acrimonious war of pens was followed by a personal conference between the two leaders at Marburg in October, 1529; but this accomplished so little in the way of reconciling them that when Zwingli died, two years later, his fellow reformer loudly proclaimed his belief that the other had been damned for his errors. The Anabaptists he called "senseless fools possessed by the Devil," and his followers joined the Catholics at the Diet of Spires (1529) in passing an edict condemning them to death. When, in 1530, a Protestant inquisition was established in Saxony with Melanchthon at its head, resulting in the banishment, life imprisonment, and execution of many nonconformists, Luther publicly expressed his approval.

On June 13, 1525, the reformer married Catharine von Bora, an ex-nun 13 years younger than himself. His domestic life was happy and hospitable. Besides his own six children he cared for several orphaned nephews and nieces, and besides numerous guests he entertained a large number of poor students. These fervent disciples wrote down everything the master said, and this "Table Talk," later published, has always enjoyed great popularity, not only because of the refreshing and Rabelaisian unreserve of the conversations, but also because of their real brilliance. During his last years, tortured by painful diseases, he sank into world weariness and disgust with life. He died, while on a visit to Eisleben, on Feb. 18, 1546.

In estimating Luther's place in history, we must pass over the partisan claims of his disciples and of his foes. He stood in an age of transition, as far removed from the mediæval on the one side as from the modern on the other. Finding its ideal in a remote past, the Reformation was not, intentionally, a progressive movement. "We know," said its leader, "that Reason is the Devil's harlot, who can do nought but slander and harm whatever God says and does." Quite consistently he proclaimed Copernicus "a great, big fool" for thinking he knew more about the motions of the stars than did the inspired writers. Erasmus he charged with atheism for applying scientific principles to the elucidation of Scripture. Neither was he in any sense a social reformer. For the improvement of the condition of the masses, as for political equality, he never cared at all. From the Middle Ages he took his conception of an authoritative ecclesiastical civilization, in which the state should be charged with the duty of stamping out heresy. Even in his own field of theology he made surprisingly little innovation. He not only postulated the existence of an ethical, personal God and of a future life, but he took from the Church of Rome most of her mysteries, including the doctrine of the Trinity and the miracles and resurrection of Christ. The one important dogmatic reform he made, that of the sacramental system, was not, according to Harnack, because he was specially enlightened, but "because of his inner experience that when grace does not endow the soul with God the sacraments are an illusion."

On the other hand, his services to the world are solid and important. In the first place, he broke the monopoly hitherto enjoyed by the Roman church. It was not so important that the new churches were different in quality from the old, as that they did effectively, and even in a cutthroat spirit, compete with her. Secondly, the Reformation really was in many respects a progressive movement, and not, as it claimed to be, mainly the return to a primitive standpoint. By appealing from the highest authority to his own private conscience and judgment, Luther set an example and initiated a method which, however much he might deprecate its use by others, was inevitably bound to lead on from one position to another, in the ever greater assertion of freedom and of the right of reason. Thirdly, in many ways, especially by abolishing monastic vows, he restored to the world and to the family countless men and women formerly living in unproductive sterility. But, more than this, he shattered the ascetic ideal which, by turning men's thoughts to the other world, had for 1500 years diverted them from the improvement of this world. By declaring that the man at the plow and the woman at the loom did God the truest service, Luther gave the necessary sanction to the immense material industry of modern times. In asserting that all laymen were priests he purposed to reduce the clerical calling to the level of any lay vocation.

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For further information, doctrinal and historical, see besides bibliography the titles: Indulgence; Monasticism; Reformation; Roman Catholic Church; Tetzel; Vow.

LU′THERANISM. The church which arose from the Reformation in Germany. This church is the mother of Protestantism. The opinions of Luther (q.v.) had spread widely when, at the Diet of Spires in 1526, the estates of Germany were divided into an Evangelical and a Romanist party, with the former in the majority. Each state was given permission to live in religion "as it hoped to answer for its conduct to God and the Emperor." This brought about a reorganization of ecclesiastical affairs in all the Evangelical territories and the changes in teaching and worship necessary to embody the new views. Three years later, in 1529, the Evangelical princes were in a minority at the Diet, and the Emperor abolished the rule of 1526. The Evangelical princes then drafted a solemn legal protestation in opposition to the Imperial decree. With this protest originated the name Protestant, by which the Lutheran church is almost exclusively known in parts of Europe. This protest led to the calling of the Diet of Augsburg by the Emperor Charles V, in 1530, where the Lutherans presented as their defense the Augsburg Confession, a religious confession in the form of a state paper, the Magna Charta of Protestantism.

Organization. The principles of Lutheranism operated against a centralized organization like that of Rome. Lutherans still clung to the purified Catholic idea. Universal priesthood and liberty of conscience stood in the way of anything that might become governmental tyranny. In the free cities there was representative government, but in other territories the secular prince assumed the rights of bishop. In Saxony the head of the church was the Elector; in Hesse, it was the Landgrave Philip; in Prussia, the Bishop George (1523); in Württemberg, the Duke Ulrich (1534); in Brunswick, the Duke of Brunswick. The larger unity of the church was expressed by the leagues, informal and formal, formed for defense against the leagues of the Roman princes. Doctrine was settled by the princes' theologians in consultation with the princes (e.g., at the Diet of Spires in 1529, at the Diet of Augsburg in 1530, at Schmalkalden in 1537). The most powerful of these leagues, with political results, was the Schmalkalden League, organized for the defense of Protestantism after the Diet of Augsburg. Primacy of the individual congregations was thrown into the background by the necessity of strong political defense against Rome on the one hand, and in order to guard against the radicalism of the Anabaptists and the socialistic insurrections of the peasants on the other.

Name. The name Lutheran, given to the new movement by its greatest foe, John Eck, and by Pope Hadrian VI, originally designated all those on the Continent, and even in England, who sympathized with the new awakening of religious thought. But gradually it became the popular term for the Protestant Evangelical church. The official designation of Lutherans in the German Empire was those "in fellowship with the Evangelical confession of Augsburg." Lindsay, the Scottish historian of the German Reformation, says that "their distinctive name is the *Evangelical* as opposed to the *Reformed* church."

Polity, etc. Baptized—the mode is secondary—persons become members of the church, with spiritual potency; but full membership involves catechetical instruction in God's Word, which precedes confirmation. The church officers are laymen, and, with the pastor, who is elected for life, unless he resign or be dismissed for cause, constitute the church council. A synod, or a number of synods in a general body, administers the general work of the church and ordains ministers. Every main or communion service is preceded by a service of confession and absolution. The church year, with its set lessons and its festivals, is observed.

Confessional Basis. The creeds of Lutheranism were born, not made, out of necessity. The earliest of them was practical. It was Luther's Small Catechism (1529), a manual of instruction for the Christian youth, which can be prayed from beginning to end, and which has been translated into more languages and circulated in larger numbers than any other book in the world except the Bible. This book for church members was followed, a year later, by the Augsburg Confession. It was followed in the next year by the Apology to the Augsburg Confession, written by Melanchthon, and defending the Confession against a confutation by Roman theologians. In 1537 came the Schmalkalden Articles, subscribed by the Protestant Estates and by the theologians at Schmalkalden. The amplest of the Lutheran confessions is the Formula of Concord, promulgated in 1577. It brings out the distinctions between Lutheranism and other types of Protestantism and ended internal controversies waged after the death of Luther. The Formula connects with the three ecumenical creeds and clears the Lutheran position on the three great centres of Christianity, viz., the person of Christ, the personality of man, and the nature of the gospel. Christ's doctrine of the Lord's Supper is grounded in his own personality, and the real presence of his spiritual body in the sacrament is taught, as against a merely spiritual presence of his body. Transubstantiation, consubstantiation, and the spatial and local extension of the body of Christ in the Supper are denied. These gradually accumulating confessions were published in 1580 as the Book of Concord. The Book of Concord replaced a large number of partial confessions known as Corpora Doctrinæ, and, though not accepted by certain types of Lutheranism, it saved Evangelical Protestantism from disintegration and restored harmony in the church.

History of the Lutheran Church. Between 1524 and 1530 the Evangelical church was organized in Saxony, Hesse, Brandenburg, East Friesland, Schleswig, Holstein, Silesia, Prussia, Brunswick, Lüneburg, Anhalt, and in such cities as Nuremberg, Magdeburg, Hamburg, Bremen, and Lübeck. In 1532 it was introduced into Württemberg, Pomerania, and Westphalia. By 1540 almost the whole of northern Germany was Protestant. Duke Henry of Brunswick was the one important prince remaining in the old faith. A few years later the Palatinate and the Archbishop and Elector of Cologne came over to the Lutheran Reformation. The movement made great progress in south Germany and in Austria as far south as the Alps.

After the death of Luther, in 1546, and under the more wavering leadership of Melanchthon, the advance of Lutheranism received a check, first, from the political pressure brought by Rome upon many of the German states, and, second, from internal divisions created by lax teachings of Melanchthon and by a secret leaning of many towards Calvinism. Until 1555 the Protestant German states were engaged in battle with the Roman League of Catholic states. In that year at the Peace of Augsburg the rights of Protestantism were guaranteed in the German and Austrian empires. Internal controversies now tore the church asunder until they were settled by the appearance of the Book of Concord. They bore on the fundamental doctrine of justification by faith, on church usage, and in part on the relations of Calvinistic teaching to Lutheranism. The attempt to interpret Lutheran doctrine in the terms of Calvinism, with its reaction, led the rulers of the Palatinates with Bremen and Anhalt to take their churches into the Reformed communion. At a later period the Landgravate of Hesse-Cassel and the court of the Electorate of Brandenburg, regarding the differences between the Lutheran and Reformed doctrine as nonessential, went over into the Reformed church. Recalcitrant pastors were banished and replaced by Calvinists.

Lutheranism, beginning in Wittenberg and Electoral Saxony, spread through the provinces of the German Empire, from Prussia on the east to Alsace, and the Hansa cities on the Baltic, and the North Sea, and to the German provinces of Russia. In Poland it was suppressed. The legal status of the church among the nations, contested desperately by Romanism, was fixed temporarily by the Religious Peace of Augsburg in 1555. This peace guaranteed the rights of Protestantism in the German and Austrian empires, but, through "ecclesiastical reservations" penalizing every ecclesiastical prince changing his faith with loss of secular power, operated as the first great check on the hitherto resistless spread and growth of the Lutheran church. The permanent status of Protestantism was determined a century later, after the issue had been fought out in the Thirty Years' War, by the Peace of Westphalia in 1648.

The Lutheran Church in Other Countries.

Beyond the German Empire, Scandinavia, Denmark, parts of Hungary and Finland became Lutheran before the close of the sixteenth century. Lutherans were found in Hungary, Holland, Livonia, the British Empire, and North America. Lutheranism early spread to parts of France, and Melanchthon's constant dream was the inclusion of Germany, England, and France in a universal Protestant Evangelical church.

In 1535 an English commission (Robert Barnes, Edward Fox, and Nicholas Heathe) from Henry VIII visited Wittenberg, and the Augsburg Confession was laid down as a basis of union for German and English Protestantism. King Henry VIII was to become a member of the Lutheran League of Schmalkalden. The next year Robert Taverner translated the Augsburg Confession and its Apology into English. Negotiations continued until 1539, when King Henry, who was unwilling to accept the articles on Abuses in the Augsburg Confession, passed the "Six Articles" in Parliament, enforcing, on penalty of death at the stake, belief in transubstantiation, also in nonnecessity of giving the laity the cup, in the celibacy of the priesthood, the efficacy of private masses, and compulsory auricular confession. This cut off negotiations between the Lutherans and England. Nevertheless Lutheranism had already influenced the Anglican church. The Lutheran movement in England had been strong, especially at Oxford and Cambridge from 1521 onward, and left its influence on the Book of Common Prayer (to Edward VI) and on the English translation of the Bible, through Luther's earlier German translation. The two English translators, Tyndale and Coverdale, were Lutheran in faith and constantly consulted the German version. The Lutheran church in France to-day numbers about 80,000 and is very active. Lutheranism, against great opposition in Spain, is gaining in favor with the people. The churches in Italy consist mostly of Germans. The church in Russia numbers about 4,000,000, and, with the church in Finland, is oppressed. Iceland, whose percentage of illiteracy and crime has been zero for hundreds of years, is wholly Lutheran. The churches in Scandinavia, i.e., in Denmark, Iceland, Norway, and Sweden, are in part under liberal theological leadership. The largest Lutheran congregation in the world is in Amsterdam.

Theology. Lutheran theology, beyond other systems, starts, centres, and ends in Christ. It views the Scriptures, God, the Trinity, and man himself, in and through Christ. God and His creation, man, faith, the Word of God, the sacraments, prayer, the Church, the law and the gospel, sin and grace, are seen from the standpoint of redemption. On the foundation of the Book of Concord the theologians of the sixteenth and seventeenth centuries, Chemnitz, Selnecker, Hutter, Gerhardt, Calovius, Quenstedt, Baier, and Hollaz, developed theology to a completeness rivaled only by the mediæval scholastic systems.

The Seventeenth and Eighteenth Centuries. External development of the church was interfered with by the Counter Reformation of the Jesuits and by the Thirty Years' War. Gustavus Adolphus gained his great victory for Protestantism in 1632, and peace was secured at Westphalia in 1648. The orthodox theology of this century was opposed by the humanism of Calixtus, inducing the syncretistic controversy; and was followed by Pietism in the eighteenth century, with Spener and August Hermann Francke as its best representatives, and Carpzov and Loescher as its opponents. John Arndt, Tersteegen, Buddeus, and in part Schmolck and Bengel, were notable in Pietistic literature. In A. H. Francke, at the Halle Orphanage and University, the Pietistic vein took a practical turn and prepared the way for mission work in foreign lands and for the Christian philanthropy and the evangelical inner-mission developments (Fliedner, Wichern, Loehe) of the nineteenth century. Zinzendorf, in so far as reckoned a Lutheran, was a Pietist. G. A. Francke in 1742 sent forth Mühlenberg to the scattered Lutherans in America to organize and develop the church in that country. Pietism was followed by rationalism, which in the eighteenth century prevailed among the learned in all countries in Europe, and which broke down the points of distinction between the Lutheran and Reformed churches, whose theology and life more and more lost their specific significance.

The Nineteenth Century. The nineteenth century opened with a deep religious feeling that opposed the shallowness of rationalism. It is notable for two movements whose conflict makes the history of the century. First came the effort of William III to unite the Lutheran and Reformed churches into one state church under one system of government. This is the Prussian Union, or Protestant Imperial church in Germany, in which the Reformed church as a body has almost disappeared, while Lutheranism has been modified by Reformed leaven. The Union went into effect in Prussia and in Nassau in 1817, in Hesse in 1823, and in Anhalt-Dessau in 1827.

The other movement was a revival of sound Lutheranism, on the basis of its confessions, inaugurated by Claus Harms, who published 95 new theses as "a transition from 1517 to 1817." It was a trumpet blast against rationalism and against the new Union. Lutheran Free churches, or Old Lutherans, arose in various provinces, as nonconformists, treated harshly at first, but gradually tolerated. Among their theologians were Vilmar and Sartorius. Loehe, in 1848, when in the storms of that day the relations between state and church threatened to collapse, wrote his Proposal of a Union of Lutherans for Apostolic Life, hoping vainly to organize a church independent of the state. Loehe, with Walther, became the leader of nineteenth-century German Lutheran colonization in the Middle West of the United States.

In 1867 the General or International Conference of Lutherans was organized, in which are represented the Old Lutheran churches of Germany (and, since 1907, those in the Union), the churches of Sweden, Norway, Hungary, and other parts of Europe, and the General Council Lutheran Church in America.

The Lutheran church in Germany is said to constitute 39 per cent of the population and is on the increase in all districts except Prussia, Bavaria, Saxony, and Württemberg, where Romanism seems to be gaining, but the "Free from Rome" movement in recent years has brought many thousands in Hungary and Austria into the fold of the Lutheran church.

Missions and Social Work. As early as 1559 Gustavus Vasa established a mission among the Lapps in northern Sweden. Others carried evangelical doctrines into Russia. Frederick

IV of Denmark sent out missionaries to India, and Ziegenbalg and Pluetschau sailed for Tranquebar in July, 1706, almost a century before the formation of any of the European missionary societies. Lutheran Halle became the centre of foreign-mission activities, and there in 1710 the Canstein Bible Institute was founded, a century before the organization of the British and Foreign Bible Society. During the nineteenth century a multitude of foreign and inner mission societies were founded, and are now active in the church in Europe and America. The inner-mission work centres in the deaconess institutions, the hospice, the seamen's mission, the immigrant mission, and the orphanage movements. The prevailing activity of the young people of the church in America is centred in the Luther League (q.v.), which has national and State organizations.

The Lutheran Church in North America. *Present Status.*—Of the 16,497,480 Protestant communicants in the United States, according to the last religious census, 1906, the Lutheran church has 2,112,494 members, or more than one-eighth of the whole number. It ranks third among the Protestant bodies, being surpassed only by the Baptists and Methodists. Its present ratio of growth throughout the country, and particularly in certain large cities, such as New York, is greater than that of any other Protestant denomination.

In the United States and Canada the church has more than 3,500,000 baptized members, with nearly 15,000 congregations and over 9000 ministers. Its membership is included in 65 synods, of which all but 14 are connected in four general bodies. Its church property amounts in value to over $100,000,000. The largest, youngest, most Germanic, and most strenuous of its organizations is the Synodical Conference. The body second in size and most central in outlook and doctrine, built on an English foundation, is the General Council. It contains the two oldest Lutheran synods in America, the Mother Ministerium of Pennsylvania and the Ministerium of New York, together with one of the two largest Scandinavian synods, viz., the Swedish Augustana Synod. The two exclusively English bodies are the General Synod and the United Synod South. All these bodies, since 1911, are resting upon practically the same official doctrinal foundation. The Joint Synod of Ohio, with its theological seminary at Columbus, and the Iowa Synod, with its seminary at Dubuque, are organizations of considerable missionary range and influence. The German communicants of the Lutheran church are said to number 1,151,613, the Norwegian communicants 344,531, and the Swedish communicants 176,000. A union is pending between the Norwegian bodies. They have seminaries at Minneapolis, St. Paul, and Red Wing. The United Norwegian Church is their largest organization. The Danes and Icelanders are small in number. The Slavic churches are in process of organization.

The pre-Revolutionary settlements and churches are in Pennsylvania, Delaware, New York, New Jersey, and in the Carolinas. Lutheranism was almost unknown in New England until the latter part of the nineteenth century, when it began to fill up, in manufacturing centres and on the farms, with Scandinavian and German Lutheran elements. The great German Lutheran migrations entered the Middle West from 1840 to 1880, and the Scandinavian migrations came in volume between 1860 and 1890. The church is weak in the Middle South, stronger in Texas, and is found on the Pacific coast. Eastern Lutheranism in Canada dates from the middle of the nineteenth century. Within the last two decades western Canada has been filling up with Lutherans from Germany, Austria-Hungary, and Russia. Lack of unity in the American church is more apparent than real and rests largely on diversity of race, language, and outlook. The growing together, if gradual, is healthy. The real unity lies in faith in the living Word of God as the divine power among men. Its proclamation precludes Lutheran ministers from preaching their own or the age's ideas. One gospel is heard in all Lutheran pulpits, and Luther's Catechism is taught to all the people of this denomination.

In 1867 the General Council reëstablished the Reformation Order of Service and Liturgy, resulting in the Church Book and Kirchenbuch. This matter made such progress that in 1881–1883 the General Council, the General Synod, and the United Synod South appointed a joint committee on Common Order of Service "on the basis of the common consent of the pure Lutheran liturgies of the seventeenth century." The Common Service was adopted unanimously by the three bodies, as well as by the English Synod of Missouri and the Norwegian English churches. The same joint committee will shortly issue a Common English Hymnal. The English church also has taken steps towards the introduction of a uniform system of instruction in its Sunday schools, on the basis of the Graded System of the General Council, which was the first denominational body in America to introduce graded Sunday-school work, and which uses an extensive apparatus of between 20 and 30 publications, some of them issued in three or more languages.

All the synods are interested in home missions, foreign missions, inner missions, and higher education. Woman's home and foreign mission societies, with general organizations, are very active. The church maintains 28 theological seminaries, with an invested capital of $3,377,064, with 121 professors and 335 students. It has 41 colleges, 54 academies or collegiate institutes, and 10 women's colleges, with an investment and endowment in these schools of $14,407,405 and with 978 professors and 16,468 students.

History. *Early Settlements.*—A Lutheran pastor, Rasmus Jensen, came to America, as chaplain of a Danish expedition, in 1619, preaching for it in its winter quarters on Hudson Bay, where he died Feb. 20, 1620, ten months before the Pilgrim Fathers landed at Plymouth Rock.

Settlements in New York.—Dutch Lutherans settled on Manhattan Island with the first Dutch colony in 1623, but were denied the services of a Lutheran minister until the English occupation in 1664. According to the Jesuit Isaac Jogues, there were Lutherans living in Manhattan in 1643. On June 6, 1657, the Lutheran consistory of Amsterdam sent the Rev. John Ernst Goetwasser to the two Lutheran congregations in New Amsterdam and Albany, but through the two Calvinistic preachers he was forced to return to Holland. In 1664 Governor Nicolls allowed full liberty of worship. In 1669 Jacob Fabricius was sent from Holland to New York, but drifted to the Delaware and was succeeded in New York and Albany by Antone Arensius (1671–91). In 1701 the New York Lutherans applied to the Swedes on the Delaware, who sent Andreas Rudman, whose successor was Justus Falckner, a German Lutheran, ordained by Swedish Lutherans in Philadelphia and who was the first Protestant minister, of any denomination, to be ordained in America. Falckner's parish stretched from New York to Albany on both sides of the Hudson and included Long Island. In 1709 a number of Lutheran immigrants under Pastor Kocherthal arrived from the Palatinate and settled on the Hudson above West Point and were augmented in 1710. In 1712 they wandered northward to the Schoharie, where they were kindly received by the Indians. From 1723 to 1729 a number of them floated down the Susquehanna and settled on the Tulpehocken in Pennsylvania, under the leadership of Conrad Weiser. In 1725 Amsterdam sent Berkenmeyer, a man of great energy and strictest adherence to the Lutheran confessions, to succeed Falckner. Under his pastorate and that of his successor, Michael Knoll, the Dutch Lutherans in New York made the transition to the German and English languages. Henry Melchior Mühlenberg and his son, Frederick Conrad Augustus Mühlenberg, the first Speaker of the United States House of Representatives, came over from Pennsylvania and further organized the Lutheran church in New York prior to the Revolution.

Swedish Settlements on the Delaware.—In 1626 Gustavus Adolphus, King of Sweden, prepared to undertake the missionary propagation of the gospel in America through colonization. He died in 1632, but his Prime Minister established a colony on the Delaware in 1638. The pastor of this colony, Reorus Torkillus, arrived in 1639 and was the first Lutheran minister to settle in the territory of the United States. He held Lutheran services in Fort Christina, and the first Lutheran church in North America, a block house, was built soon afterward. In 1643 Governor Printz arrived from Sweden with express instructions to maintain the Lutheran service of the Augsburg Confession. With him came Rev. John Campanius, who built a church at Tinicum, 9 miles southwest of Philadelphia, and held daily services in accordance with the full Lutheran ritual. For his mission work among the Indians, nearly a half century before the arrival of William Penn, he translated Luther's Catechism into an Indian dialect. In 1669 a block church was erected at Wicaco, Philadelphia, superseded in 1700 by the Lutheran Gloria Dei Church, still standing, as is also the Lutheran Trinity Church (1698) at Wilmington, Del. Among the pastors on the Delaware, whose domain extended far inland up the Schuylkill River, were Rudman, Bjoerk, Auren, Wrangel, and Acrelius. The last pastor from Sweden arrived in 1771. By accepting Anglican curates as assistants he opened the way for the transition of these congregations to the Episcopal church.

German Settlements in Pennsylvania.—Fabricius preached in German in the Swedish block church erected in 1669. In 1684 the first English Lutheran services were held in Germantown and Philadelphia by Heinrich Bernard Köster. The first German Lutheran church in Pennsylvania, at Falckner's Swamp, is thought to date from 1703. The Germans, chiefly exiles from the Palatinate, began to arrive in numbers early in the eighteenth century, settling in New York and Pennsylvania. In 1728 Rev. John Caspar Stoever began his missionary travels from Germantown and Philadelphia to the Susquehanna at York and into Maryland and everywhere organized German Lutheran congregations. But it was left to the Rev. Henry Melchior Mühlenberg (q.v.), who arrived in Philadelphia in 1742, to bring these primitive congregations into order, to provide them with good pastors, and to introduce schools for the education of the children. By the middle of the eighteenth century Pennsylvania contained about 30,000 Lutherans, of whom four-fifths were Germans and one-fifth Swedes.

Organization of the Ministerium of Pennsylvania.—In 1748 Mühlenberg, with six other ministers and with lay delegates from congregations, organized the Ministerium of Pennsylvania, the original Lutheran synod in America. In 1781 it became the Ministerium of the Evangelical Lutheran Church of North America. In 1786 the second synod, the Ministerium of New York, was formed; in 1803, the Synod of North Carolina; and in 1818, the Synod of Ohio. The mother synod of Pennsylvania was at this time sending out its missionaries into the West and South, rendering the organization of new synods possible.

Isolated groups of German Lutherans arrived throughout the eighteenth century along the whole Atlantic coast in New Jersey, Virginia, North and South Carolina, and Georgia. The Salzburger Lutherans in Georgia were a particularly prominent and successful colony and were visited by Wesley and Whitefield.

Organization of the General Synod.—The General Synod, aiming at a union of all American Lutherans, was founded in 1820. This opened a new era in the church. The oldest theological seminary of the General Synod is Hartwick Seminary, in New York, founded in 1797. The leading seminary is that at Gettysburg, founded in 1826. To the General Synod also belong Wittenberg Theological Seminary at Springfield, Ohio, Susquehanna University, at Selinsgrove, Pa., and the seminary at Atchison, Kans.

Organization of the United Synod.—During the Civil War the synods south of the Potomac withdrew from the General Synod, and from them has been evolved the United Synod of the South. The theological seminary of this synod is located at Columbia, S. C.

The General Council of the Church in North America.—This large body comprises 13 synods, including, among others, the two historical ministeriums of Pennsylvania and of New York, the Augustana Synod, itself covering the United States, and three synods in Canada. Doctrinally and historically it is a central body between the various wings and maintains the seminary at Philadelphia, projected by the patriarch Mühlenberg, the Augustana Seminary at Rock Island, the Chicago Seminary, the Pacific Seminary at Portland, and the Canadian Seminary at Waterloo. It has 10 colleges.

Institutions.—The church in America maintains 28 theological seminaries, 41 colleges, 54 academies, 10 ladies' colleges, 61 orphans' homes, 40 homes for the aged, 5 homes for defectives, 9 deaconess mother houses, 46 hospitals, 15 hospices, 19 immigrant and seamen's missions, about 20 societies for the homeless, and 8 city missions. It sustains many Christian kindergartens and parochial schools.

Organization of the Synodical Conference.—The largest German Lutheran body is the Synodical Conference, originating from the settlement in Missouri in 1839 of several colonies of Saxons who, driven into voluntary exile by the sway of rationalism, crossed the Atlantic and sailed up the Mississippi River. Their synod was organized in 1847, under the leadership of Walther, one of the greatest of the Lutheran theologians and organizers in America. Each of their congregations maintains a parochial school, and their work is extended over the whole of America, including missions among the negroes and a synod in Brazil. Their Concordia Theological Seminary at St. Louis has 334 students. There is also a practical seminary at Springfield, Ill.

Statistics. The statistics of the Lutheran church for 1914, which show a very marked increase over those published a decade ago, are as follows: the United States and Canada—General Council, 504,023; General Synod, 328,586; Synodical Conference, 778,500; United Synod South, 50,748; independent synods, 690,528; total, 2,352,385. The statistics of the rest of the world are: the German Empire, 37,800,000; the Russian Empire, 12,156,000; other European countries, 16,132,100; India, 221,000; other Asiatic countries, 41,500; Africa, 382,566; Oceanica, 207,842; America, except the United States and Canada, 704,016; total, 69,998,409.

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LUTHER LEAGUE OF AMERICA, The. A federation of the young people's societies in the Lutheran churches, formed at Pittsburgh, Pa., in 1895. Its basis is the unaltered Augsburg Confession and "it receives into membership any society of whatever name connected with a Lutheran congregation or a Lutheran institution of learning." It holds biennial conventions, and its interests are committed to an executive committee and to a general secretary, who promotes the organization and growth of local societies. Its organ, *The Luther League Review*, is published monthly in New York. The Luther League is organized in 17 States and 89 districts and has a membership in the United States of 41,000. There are Luther League organizations in Canada, which is a member of the Luther League of America, and also in Porto Rico. There is an All India Luther League in India, and local Luther leagues exist in Japan and China. Consult Bacon and Northrop, *Young People's Societies* (New York, 1900), and the *Luther League Handbook* (ib.).

LUTHER'S HYMN. The name given to the famous hymn by Luther, "Ein' feste Burg ist unser Gott," published in 1529.

LÜTKE, lụt′kẹ, Feodor Petrovitch, Count (1797–1882). A Russian navigator and explorer, born in St. Petersburg. He was educated for the Russian naval service, and, after serving in England for a short time, was an associate in a Russian expedition around the world (1817–19). From 1821 to 1825 he made a series of exploratory journeys to the coasts of Kamchatka and Nova Zembla. In 1826–28, commanding the fourth Russian voyage of circumnavigation, he explored the coasts of Siberia and Russian America and discovered many islands. Appointed admiral in 1855, he was subsequently employed in conspicuous service. In 1845 he assisted in the establishment of the Russian Geological Society, and in 1864 was president of the Academy of Sciences at St. Petersburg. His principal published work is his *Four Voyages across the Arctic Seas* (1824).

LUTON, lo͞o'ton. A market town in Bedfordshire, England, 30 miles northwest of London, on the river Lea (Map: England, F 5). The chief buildings are the Strawplait Hall, where the Monday morning market is often attended by 2000 people, town hall, corn exchange, and a fine fourteenth-century parish church. It owns baths, a free library, markets, parks, remunerative real estate, provides technical instruction, and maintains a fire brigade and electric lighting. It is the chief English seat of straw-plaiting manufactures for hats, bonnets, etc., employing several thousand persons. This industry was established by James I by the transplantation from Scotland of Lothringian artisans who had settled in that country. Luton has also felt-hat works, brass and iron foundries, and automobile works. Pop., 1901, 36,400; 1911, 49,978. Consult Davis, *History of Luton* (Luton, 1855).

LUTTER AM BARENBERGE, lu̧t'ẽr ăm bä'r*e*n-bẽr'g*e*. A small town of the Duchy of Brunswick, in the Circle of Gandersheim. It is noted for the victory gained there in the Thirty Years' War by the Catholic general Tilly over Christian IV of Denmark, Aug. 27, 1626.

LUTTEROTH, lu̧'t*e*-rôt, Ascan (1842–). A German landscape painter, born in Hamburg. He was a pupil of Calame at Geneva (1861–64) and of Oswald Achenbach at Düsseldorf (1864–67). After completing his studies in Italy in 1868–70, he settled in Berlin, and in 1877 removed to Hamburg, where he became professor in 1891. His pictures, chiefly of Italian scenery, remarkable for coloristic splendor, exquisite light effects, and pervaded by a poetical atmosphere, include: "Isola Bella" (1884, Hamburg Gallery); "Evening on the Mediterranean" (1886, National Gallery, Berlin); "View of Mount Kilimanjaro" (1889, Leipzig Museum); "Lago Maggiore" (1894); "Monte Rosa" (Magdeburg Museum); and three landscapes in the Hamburg City Hall.

LUT'TRELL, Henry (?1765–1851). An English writer of society verse. He was a frequent guest at Samuel Rogers's famous breakfast parties and at Holland House; and whatever the company he always shone brilliantly. Scott called him "the great London wit." He published a delightful society epic entitled *Advice to Julia: A Letter in Rhyme* (1820; enlarged, 1822), resembling in theme and style Gay's *Trivia.* From his pen came also *Crockford House* (1827), a satire on high play.

LÜTTRINGHAUSEN, lu̧t'rĭng-hou'z*e*n. A town in the Prussian Rhine Province, Germany, 5 miles southeast of Elberfeld. It has a fifteenth-century Gothic church and a monastery. The town has important manufactures of cloth and cotton textiles, gas stoves, gas and water meters, bathing apparatus, bricks, and boilers. Pop., 1900, 11,261; 1910, 13,560, chiefly Protestants.

LUTUAMIAN (lo͞o'to͞o-ăm'ĭ-*a*n) **STOCK.** See Klamath; Modoc.

LUTZ, Frank Eugene (1879–). An American zoölogist. Born at Bloomsburg, Pa., he graduated from Haverford College in 1900 and from the University of Chicago (Ph.D.) in 1907. From 1904 to 1909 he made researches on variation, heredity, and assortive mating at the Cold Spring Harbor (N. Y.) station for experimental evolution. In 1909 he was appointed assistant curator of the American Museum of Natural History in New York City.

LÜTZELBURGER, lu̧t's*e*l-bu̧r'gẽr, Hans (also called Hans Franck) (c.1495–1526). A German wood engraver. He was born in Augsburg, where he was probably instructed in his art. He was active in Basel, whither he appears to have gone in 1522 as an associate of Hans Holbein the Younger, with whom he collaborated until his death. It was he who cut the blocks for Holbein's numerous designs for wood engravings, particularly the illustrations for the Old Testament and the "Dance of Death." A curious example of his art is a woodcut of "Peasants Fighting with Nude Men in a Wood," after a design by Holbein. The best known of his other engravings are several alphabets, two poniard sheaths, a portrait of Erasmus, and "The Sale of Indulgences." In delicate, sympathetic, and correct rendering of the draftsman's design, Lützelburger has never been surpassed; he is probably to be regarded as the most important wood engraver of the German Renaissance.

LÜTZEN, lu̧'ts*e*n. A small town in the Prussian Province of Saxony, 10 miles southwest of Leipzig, with 4086 inhabitants in 1910. It is famous for two battles fought in its vicinity. The first battle of Lützen was fought in the course of the Thirty Years' War, between Gustavus Adolphus, King of Sweden, and Wallenstein, commander in chief of the Imperial forces, on Nov. 16 (O. S. Nov. 6), 1632. At the end of September Gustavus Adolphus had been compelled to leave Nuremberg, having been starved out by Wallenstein. The latter marched northward to force the wavering Elector of Saxony, John George, to join the Imperialist cause. Gustavus Adolphus hurried after him, united his forces with those of Duke Bernhard of Saxe-Weimar, and attacked Wallenstein. The Swedes numbered about 15,000 men; Wallenstein had approximately 25,000. The battle was contested with great stubbornness on both sides. Gustavus Adolphus was killed early in the day. Night finally put an end to the battle, the Swedes remaining masters of the field. Each side is said to have lost about 10,000 in killed and wounded. Consult Droysen, "Die Schlacht bei Lützen," in *Forschungen zur deutschen Geschichte* (Göttingen, 1862), and Dodge, *Gustavus Adolphus* (Boston, 1895). (See Gustavus II Adolphus; Thirty Years' War; Wallenstein.) The second battle of Lützen took place on May 2, 1813, a little to the south of the site of the first battle, between the French under Napoleon and the Russo-Prussian army under General Wittgenstein. Napoleon was victorious, but, as he had no cavalry with which to pursue, his victory brought him little benefit. Each side lost about 20,000 men. Consult Sloane, *Life of Napoleon Bonaparte,* vol. iv (New York, 1896). See Napoleon I.

LUTZK, lu̧tsk (Pol. *Luck*). An old town in the Government of Volhynia, Russia, situated on the Styr, about 120 miles southeast of Lublin (Map: Russia, C 4). It was the capital of an independent principality in the Middle Ages and a place of great commercial importance. It passed to Lithuania and later followed the fortunes of Poland. In recent times it has been fortified. It is the seat of a Roman Catholic bishop and has a considerable shipping trade on the river Styr. Pop., 1897, 18,525; 1912, 31,806.

LÜTZOW, lụ′tsȯ, Adolf, Baron (1782–1834). A German soldier, remembered as the leader of a famous volunteer corps in the War of Liberation. He was born in Berlin, entered the Prussian army in 1795 and took part in the disastrous battle of Auerstädt (1806); retired as major in 1808 because of the Treaty of Tilsit; but, restored to active service in 1811, was authorized (February, 1813) to organize a corps of volunteers, destined to carry on a guerrilla warfare in the rear of the enemy. The corps was named after Lützow and known also, from its uniform, as the Black Troop, or Black Riflemen. It distinguished itself especially in the engagement around the Göhrde Forest, where Lützow was severely wounded. Having rejoined the army in France, he was sent against Denmark, but was taken prisoner in March, 1814, and, his corps being disbanded after the conclusion of peace, he received command of a cavalry regiment. Captured again in the battle of Ligny and delivered at Belle-Alliance, he was appointed colonel and in 1822 promoted to major general. On retiring in 1830 he was made lieutenant general. The valor of the Black Troop is commemorated in the poem "Lützows wilde, verwegene Jagd," composed by Karl Theodor Körner, who, as Lützow's adjutant, met his death in battle. See Körner, Karl Theodor.

LÜTZOW, Franz Heinrich Valentin, Count (zu Dreylützow und Seedorf) (1849–1916). A Bohemian historian, born in Hamburg and educated at Vienna and Innsbruck. He entered the diplomatic service, was an attaché in Brussels and Rome, and was Secretary of the Austrian Legation at The Hague and at London. In 1885–89 he was a member of the Austrian Parliament, and after 1881 chamberlain to the Emperor of Austria. He was Ilchester lecturer, on *The Historians of Bohemia* (1905), at Oxford in 1904 and lectured on Bohemian history in American universities in 1912. In Bohemian he wrote for periodicals on politics and English literature, but his best-known work is written in English and includes: *Bohemia, an Historical Sketch* (1896; revised, 1909); *History of Bohemian Literature* (1899); *Prague* (1902), in "Medieval Towns Series"; a translation of Comenius' *Labyrinth of the World* (1905); *The Life and Times of Master John Hus* (1909); *The Hussite Wars* (1914).

LÜTZOW, Karl von (1832–97). A German art historian and critic, born at Göttingen. He studied philology and archæology at Göttingen and Munich, and was associated in Berlin with Lübke in editing *Denkmäler der Kunst*. He was appointed docent of art history at the University of Munich in 1858, then edited in Vienna the *Rezensionen und Mittheilungen über bildende Kunst*, and in 1864 became professor at the Academy, where in 1866 he was also made librarian and custodian of the cabinet of engravings. His valuable publications include: *Die vervielfältigende Kunst der Gegenwart* (1886 et seq.); *Die Kunstschätze Italiens in geographisch-historischer Uebersicht geschildert* (2d ed., 1900); *Geschichte des deutschen Kupferstichs und Holzschnitts* (1891). He founded at Leipzig the *Zeitschrift für bildende Kunst* (1866 et seq.), of which he was editor up to the time of his death.

LÜTZOW, Therese von (1804–52). A German author, known as Therese Bacheracht. She was born at Stuttgart, subsequently removed to Hamburg, and finally to St. Petersburg, where her father, H. von Struve, was Ambassador. She accompanied her second husband, Colonel von Lützow, to Java, where she died. Her chief publication is the correspondence between Wilhelm von Humboldt (q.v.) and her friend Charlotte Diede, under the title *Briefe an eine Freundin von Wilhelm von Humboldt* (1847; 12th ed., 1891). Her other works include society novels, such as *Falkenberg* (1843), *Lydia* (1844), *Weltglück* (1845), *Heinrich Burkart* (1846), and several interesting volumes of travel. Consult Gutzkow, *Rückblicke auf mein Leben* (Berlin, 1875).

LUVERNE, lo͞o-vẽrn′. A city and the county seat of Rock Co., Minn., 221 miles by rail southwest of Minneapolis, on the Rock River and on the Chicago, Rock Island, and Pacific and the Chicago, St. Paul, Minneapolis, and Omaha railroads (Map: Minnesota, A 7). It has a fine courthouse, a large hospital, city hall, and a public library. The city is surrounded by an agricultural district, and there are granite quarries, grain elevators, a flour mill, creameries, brickyards, automobile factory, tile works, concrete-block plant, etc., and important nursery and stock-breeding interests. There are municipally owned water works and electric-light plant. Pop., 1900, 2223; 1910, 2540.

LUX. See Illumination.

LUXEMBERG, John of. See John of Luxemburg.

LUXEMBOURG, lụks′äɴ′bo͞or′, François Henri de Montmorency-Bouteville, Duke of (1628–95). A marshal of France. He was born in Paris, the posthumous son of François de Montmorency, Count of Bouteville, whom Louis XIII caused to be beheaded for participating in a duel. He was brought up with the great Condé (q.v.), with whom he fought at Rocroi (1643) and Lens (1648), and took part in the disturbances of the Fronde, going over with his leader to Spain. Received into favor by Louis XIV after the Peace of the Pyrenees (1659), he served as a volunteer under Turenne in Flanders (1667) and as the lieutenant of Condé in Franche-Comté in 1668. He commanded in the Netherlands in 1672–73, and his masterly retreat in the latter year stamped him as one of the great generals of his day. In 1674 he fought under Condé at Seneffe against William of Orange and was made a marshal the next year. In the campaign of 1677 he defeated the Prince of Orange at Mont-Cassel (April 11) and compelled him to raise the siege of Charleroi. After the Peace of Nimwegen Louvois attempted to destroy him by implicating him in the famous poison trials. After a short term of imprisonment in the Bastille he was acquitted by the Chambre Ardente (q.v.). The King appointed him to the command of the army in Flanders in 1690. On July 1 of that year he gained a victory over the Prince of Waldeck at Fleurus; defeated William III of England at Steenkerke (Aug. 3, 1692), and at Neerwinden (July 29, 1693), and took Charleroi. He died Jan. 4, 1695, at Versailles. He assumed the title Luxembourg on marrying the heiress of that house in 1661. Consult P. de Segur, *La jeunesse du maréchal de Luxembourg, 1628–68* (Paris, 1900), and id., *Le maréchal de Luxembourg et le prince d'Orange, 1668–78* (ib., 1902).

LUXEMBOURG PALACE. A palace situated in the Rue de Vaugirard, in the southern part of Paris, celebrated for its architecture, its gallery of modern French art, and its gardens. Its erection was begun in 1616 by Salomon de Brosse, for Maria de' Medici, and its rusticated masonry was intended to recall the architecture of the Pitti Palace in Florence, her former home. It was completed in 1620, but altered internally by Chalgrin near the end of the eighteenth century. Between 1835 and 1841 the main body of the palace was nearly doubled in size and provided with a new southern or garden façade reproducing the former one, while in the court inclosed between the old and new constructions a magnificent semicircular hall was built for the sessions of the House of Peers, and later of the Senate. These additions were the work of A. de Gisors. The Hall of the Senate was destroyed by fire in 1859, but was rebuilt on the same design. The name of the palace is derived from the Duke of Piney-Luxembourg, whose mansion once stood on the same site, but it has been officially known, under different governments, by the names of the governmental bodies which have successively occupied it; e.g., Palais du Directoire, du Consulat, du Sénat-conservateur, de la Chambre des Pairs, de la Préfecture, and du Sénat. It was occupied by the Senate from 1852 to 1870, and thence until 1879 by the Prefecture of the Seine and the municipal council. It has since 1879 been again occupied by the Senate. It has in addition served throughout nearly its whole history as a royal or public picture gallery. An important series of 24 paintings by Rubens, illustrating the life of Maria de' Medici, once occupied the east gallery, but is now in the Louvre, and the splendid Museum of Modern Art, which formerly occupied this gallery and other apartments of the palace, is now housed in a neighboring and comparatively modern building, though still known as the Musée du Luxembourg. This is on the whole the most important collection of contemporary art in existence and comprises both sculpture and painting. About 10 years after an artist's death, his works are removed to the Louvre or to the provincial galleries. Most of the works are by French artists, but there is a special room devoted to other nationalities, the American being the best represented next to the French. The magnificent ceilings and mural decorations of the Senate Chamber, Salle d'Attente, and other apartments of the palace constitute in themselves a notable collection of the works of Flandrin, Bouchot, Vauchelet, Pujol, and others, besides examples of the work of Rubens, Philippe de Champagne, Poussin, and other masters of the seventeenth century.

The building itself, with all its alterations, has preserved unchanged its original style and character. While recalling by its rusticated masonry the garden front of the Pitti Palace, it is thoroughly French in design. The main structure, originally H-formed in plan, fronts on a court of honor, which measures 300 by 360 feet, and is inclosed on the flanks and front by low wings or galleries. The entrance from the Rue de Vaugirard to this court is through a dome-capped portal serving as a clock tower, an extremely successful design. Each of the four façades of the main palace, as enlarged in 1835–41, consists of a central pavilion with two corner pavilions, the whole being covered by a high roof of the type commonly known as a mansard. The proportions of all parts of the building are happy, the composition and details dignified and harmonious, the internal decorations admirable and in places sumptuous. The apartments of Maria de' Medici were restored in 1817 and refurnished in the style of her time, and the elegant chapel adjoining them was restored in 1842. The gardens of the Luxembourg are of great extent and beauty. Originally laid out by De Brosse, they were nearly stripped in the Revolution, but restored in 1801, and although somewhat reduced in size by the cutting through of modern streets, they are still among the most noted gardens in France, and the only survival in Paris of a genuine Renaissance garden.

The Petit Luxembourg (formerly the Petit Bourbon), adjoining the above palace on the west, and occupied by the President of the Senate, was built by Richelieu in 1629, partly on the site of the old convent of the Filles du Calvaire. The elegant chapel by A. de Gisors (1842) stands on the site of the original chapel of the convent, some extant portions of which have been annexed to the Petit Luxembourg.

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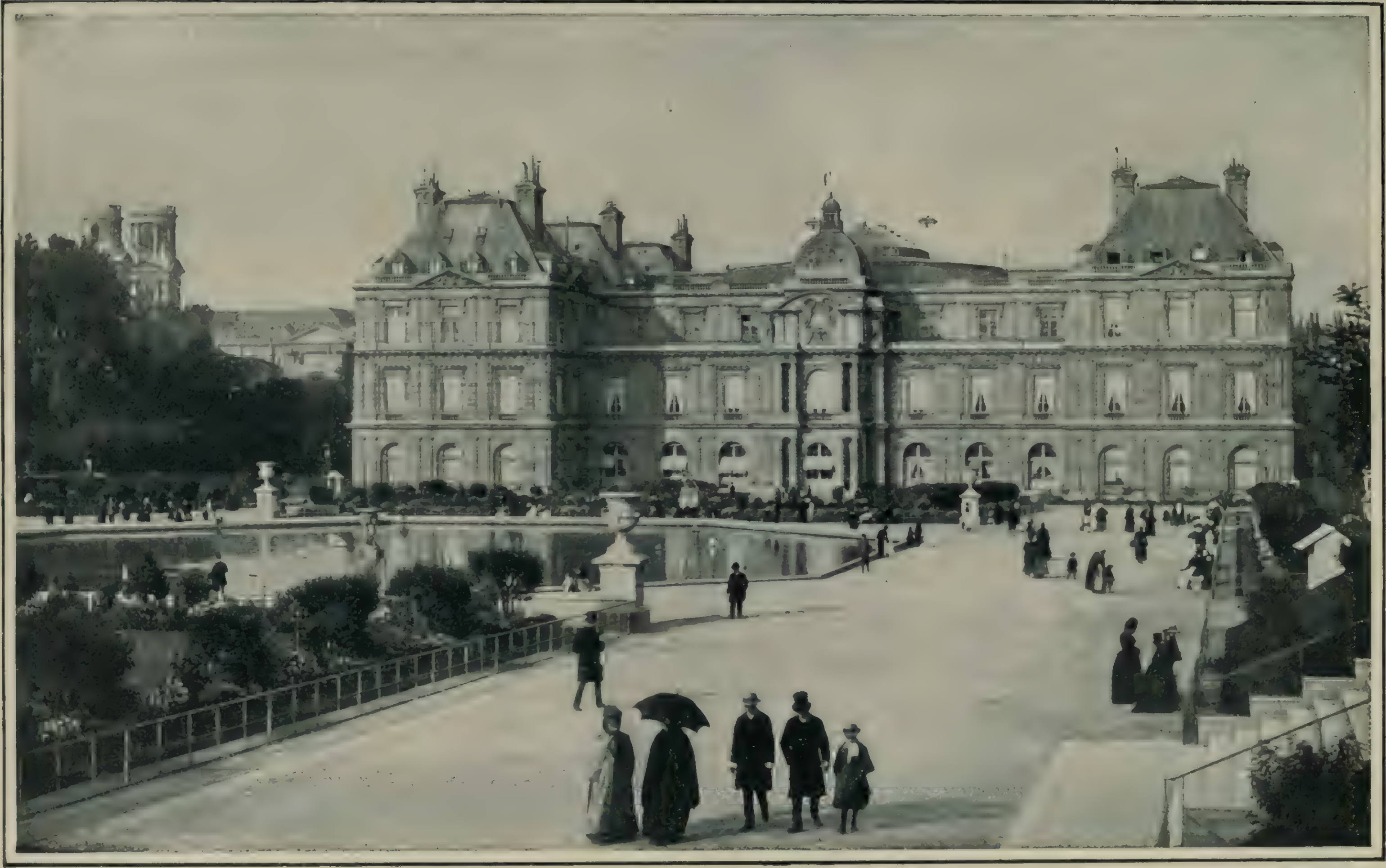
LUXEMBURG, lŭks′em-bûrg, *Dutch pron.* -bụrɢ. The largest province of Belgium, occupying the southeastern part of the country (Map: Belgium, E 5). Area, 1706 square miles. It belongs to the region of the Ardennes (q.v.), and has important iron, slate, and marble deposits. Much of the country is in forest land, which is maintained by a system of enforced silviculture. Agriculture is the chief occupation. The principal rivers are the Ourthe in the north and the Semois in the south. Pop., 1900, 219,210; 1905, 227,360; 1910, 231,215. Prior to 1839 the province formed a part of the Grand Duchy of Luxemburg. Capital, Arlon (q.v.). The province was occupied by the Germans in the early part of the European War which broke out in 1914. See War in Europe.

LUXEMBURG. An independent grand duchy of Europe, bounded by the Prussian Rhine Province on the north and east, German Lorraine and France on the south, and Belgium on the west (Map: Germany, A 4). Area, 998 square miles. The northern and more elevated part of the country belongs to the region of the Ardennes, and reaches an altitude of about 1800 feet. The southern part belongs to the plateau of Lorraine, is perceptibly lower, and is of remarkable fertility. The district lies in the basin of the Moselle (which forms a part of the eastern boundary) and is watered by the Sauer and its tributaries. The climate is somewhat raw and more changeable than that of Belgium. Agriculture and stock raising are the principal industries. More than half the area of the duchy is arable land, and cereals, grapes, and other fruits are cultivated on a large scale. Luxemburg is noted for its mineral deposits: iron, copper, antimony, and lead exist, but iron only is extensively exploited, there being 83 iron mines employing over 8,000 people. Large quantities of building stone are quarried and exported. In connection with the mines there are numerous iron foundries and iron and steel mills producing goods valued at some $28,000,000 each



THE LUXEMBOURG PALACE AND GARDEN

year, and these are the country's most valuable exports. Minor industries include the manufacture of woolens, beer, gloves, pottery, paper, and leather.

Luxemburg is a constitutional monarchy administered under a constitution promulgated in 1848 and revised in 1856, 1868, and 1911. The legislative power is vested in a Chamber of Deputies of 53 members elected for six years by a limited suffrage. The executive is in the hands of a Minister of State, assisted by the directors of finance, justice, and the interior, all of them nominated by the sovereign. There is also an advisory body of 15 nominated members, called the Council of State, from which seven members are elected to form a court of administration.

There is no compulsory military service, the army of some 150 members and the gendarmerie of similar strength are recruited from volunteers. Education is compulsory and there are excellent primary and secondary schools. Religious freedom exists, but the majority of the inhabitants are Roman Catholics, the duchy forming an episcopal see, the bishop of which is directly dependent upon the Pope. The revenue and expenditure in 1914 amounted to 4,246,000 and 4,516,000 respectively. The franc is the monetary standard and the duchy has no separate coinage except a small quantity of fractional coins. The cultured and commercial classes use the French language, but the peasantry speak a German dialect, plentifully interlarded with French words.

The duchy has ample means of communication. There are numerous good roads; 509 miles of railroad, to construct which a public debt of $2,471,500, bearing 3½ per cent interest, was incurred; and 436 miles of telegraph. There are an extensive telephone service and some 124 post offices. Pop., 1890, 211,088; 1910, 259,899, including some 4,000 Protestants and 1500 Jews. Capital, Luxemburg (q.v.).

History. The mediæval counts of Luxemburg took their name from the castle of Lützelburg, around which the town of Luxemburg (originally called Lützelburg) grew up. The County of Luxemburg, which formed one of the petty principalities of the Holy Roman Empire of the Germans, first came into prominence in 1308, in which year the German princes elected Count Henry to fill the Imperial throne. In 1310 his son, John the Blind, who had married the sister of Wenceslas III of Bohemia, became King of that country. (See BOHEMIA.) John's son, Charles, King of Bohemia and German Emperor (Charles IV), gave the country to his stepbrother, Wenceslas, and raised it in 1354 to the rank of a duchy. In 1443 Luxemburg fell to Burgundy, and with the possessions of that house came into the hands of Spain, remaining, however, part of the German Empire. In the Peace of Utrecht in 1713 it was transferred to Austria. By the Peace of Campo-Formio (q.v.) it was ceded to France in 1797. It was elevated by the Congress of Vienna in 1815 to the rank of a grand duchy, and became a member of the Germanic Confederation, but under the personal sovereignty of the King of the Netherlands as indemnity for the loss of Nassau. When Belgium became an independent kingdom (1831) Luxemburg was divided between it and Holland —the latter, however, retaining little more than the city of Luxemburg till 1839, when, by a treaty signed in London, another part of the territory was taken from Belgium and added to the city, forming the present Grand Duchy of Luxemburg, which remained subject to the King of the Netherlands. After the dissolution of the Germanic Confederation in 1866 the King of Holland wished to sell Luxemburg, which had been garrisoned since 1815 by Prussian troops, to France; but the summary action of Bismarck, who guided the policy of Prussia, prevented this barter, and in 1867 an international conference at London made Luxemburg a neutral sovereign state, under a guarantee of the Powers. In 1890 the death of William III of Holland rendered the house of Orange extinct in the direct line of succession, and Luxemburg passed to the nearest collateral male line, represented by Adolphus, Duke of Nassau, who in December of that year assumed the title of Grand Duke of Luxemburg, thus ending the union that had made Luxemburg an appanage of the Netherlands. Luxemburg was practically the first country of Europe to be affected by the titanic struggle which broke out in August, 1914. In spite of the protests of the Grand Duchess Marie-Adelaide (q.v.) and the guarantees of the Treaty of London (1867), Emperor William of Germany marched his troops directly across this neutral territory in order to get a more direct route to France. (See WAR IN EUROPE.) Consult: Schötter, *Geschichte des Luxemburger Landes* (Luxemburg, 1882); Bonnardot, *Les archives de l'état de Luxembourg*, vol. xli of the publications of the History Section of the Luxemburg Institute (ib., 1890); T. H. Rossmore, *In Further Ardenne: Study of the Grand Duchy of Luxemburg* (New York, 1905); also bibliography under BELGIUM; FRANCE; GERMANY; NETHERLANDS.

LUXEMBURG. The capital of the Grand Duchy of Luxemburg, picturesquely situated on the Alzette, 42 miles north of Metz by rail (Map: Belgium, E 5). The city consists of two parts, the Oberstadt, or upper town, crowning a rocky height, 200 feet above the Unterstädte, or lower towns, which lie in the encircling ravine, the two parts communicating by flights of steps and winding streets. Five lofty viaducts span the valley, including a splendid stone bridge completed in 1903, and connect the Oberstadt with the surrounding country. Public gardens occupy the site of the fortifications constructed under the direction of Vauban, after the plans of a Spanish engineer, which gained for Luxemburg the appellation of "the Northern Gibraltar," and which were dismantled in 1872. A few remains of these works include the Spanish towers and the tunneled headland of Le Bouc, which commands an extensive view. The fine Gothic cathedral of Notre Dame (1613), the Palais du Roi, dating from 1580, restored in 1893–94, and now the grand ducal residence, and the town hall (1844), with a collection of paintings, are among the chief public buildings. The educational institutions include a theological seminary, athenæum, and public library. The industrial establishments, comprising cotton and linen mills, tanneries, breweries, dye works, etc., are situated in the Unterstädte. An active general trade is carried on. The city had its origin in the ancient castle of Lützelburg, a name which was afterward changed to Luxemburg. The place was a fortress of the Germanic Confederation (1815–66), and was garrisoned by Prussian troops, who retired in 1867 after the demolition of the fortifications and the neutrality of Luxemburg had been decided by the Treaty of London. Pop., 1900, 20,928 (mostly

Roman Catholics, Protestants numbering only 552 and Jews 407); 1910, 20,848.

LUX'OR. A village of Upper Egypt, on the east bank of the Nile, in about lat. 25° 50′ N., standing upon the site of ancient Thebes, a little to the southwest of Karnak (q.v.) (Map: Egypt, C 2). Its Arabic name, El Ḳusur (plural of El Ḳasr), of which Luxor is a corruption, means the palaces, and refers to the magnificent ruins upon which the village encroaches. The ruins are the remains of a great temple built by Amenophis III on the site of an ancient sanctuary, and dedicated to the Theban triad Ammon, Mut, and Chons. It was not entirely finished at the death of Amenophis, and his son, the fanatical reformer, Amenophis IV (q.v.), caused the name of Ammon and the reliefs representing the god to be obliterated throughout the building. Under Seti I the reliefs were restored, and Ramses II added a great colonnaded court, before whose massive pylon he erected six colossal statues of himself. Three of these statues are still in place. Before the main entrance stood two obelisks erected by Ramses II; one of them is still in place, while the other now stands in the Place de la Concorde in Paris. The front of the pylon is covered with reliefs representing scenes from the Asiatic wars of Ramses II, and below the reliefs is inscribed the poetic account of the battle of Kadesh on the Orontes, usually known as the Epic of Pentaur (q.v.). A gate between the towers of the pylon gave entrance to the great court of Ramses II, 187 feet long and 168 feet wide, with a colonnade (74 pillars) running along its four sides. In the northwestern corner are the remains of a chapel built by Thothmes III. This court was formerly completely covered up with rubbish, and houses were built over it; the western side has been cleared, but a mosque still stands over the eastern portion. The walls of the court are richly adorned with reliefs and inscriptions, and near the southern end are several colossal statues of Ramses II. From the court a colonnade of several pairs of columns, each 50 feet high, leads to a second court (148 feet long and 168 feet broad) built by Amenophis III. A colonnade, of which a large portion is well preserved, runs around three sides of it, while the upper end opens into a hypostyle hall, its roof supported by 32 columns. A door in the rear wall of the hypostyle hall leads into a smaller hall, which in Christian times was used as a church, the doorway leading to the inner rooms of the temple being walled up and converted into a niche. The hall is flanked by two chapels dedicated to the deities Mut and Chons, respectively, and to the rear is a vestibule upon which opens a sanctuary, built by Amenophis III, and rebuilt by Alexander the Great, designed for the reception of the sacred bark of Ammon. To the east of the vestibule and sanctuary are two small halls containing reliefs, representing the birth and accession to the throne of Amenophis III. To the rear is another hall, and into it opens another sanctuary in which was kept the sacred image of the god. Consult: Sir J. G. Wilkinson, *Topography of Thebes* (London, 1835); K. R. Lepsius, *Denkmäler* (Berlin, 1849–58); Johannes Dümichen, *Geschichte des alten Aegyptens* (ib., 1878); Duressy, *Notice explicative des ruines du temple de Luxor* (Cairo, 1893); Baedeker, *Egypt* (6th ed., Leipzig, 1908). See also Thebes.

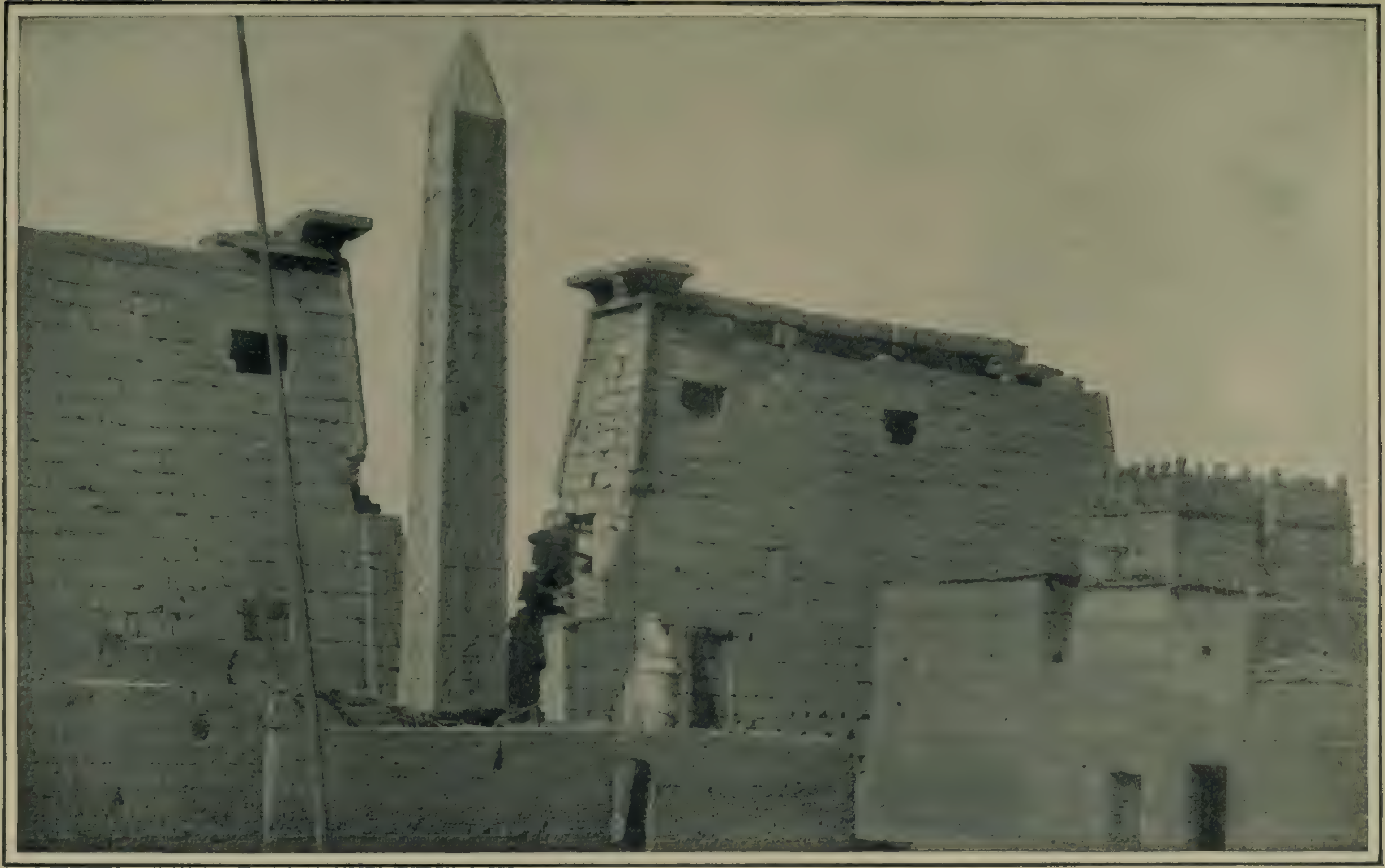
LUYNES, lụ'ēn', Charles d'Albert, Duke de (1578–1621). A French minister and favorite of Louis XIII. With Vitry, captain of the guard, he plotted against Concini, the favorite of the Queen mother, Maria de' Medici, and in 1617, after Concini's assassination, received the latter's estates in Italy and France and Marquisate of Ancre, which was then named Albert. Luynes recalled the old ministers of Henry IV; effected the Peace of Angoulême (1619); put down the Huguenot rebellion of 1621; became Constable of France in the same year; and played a fairly clever part in diplomacy, although he sacrificed the interests of France at Ulm, and assisted the projects of Ferdinand II (1620). In 1621 he died suddenly while campaigning against the Huguenots. See Louis XIII.

LUYNES, Honoré Théodoric Paul Joseph d'Albert, Duke de (1802–67). A French archæologist. He was born in Paris and studied language and archæology. He was elected to the Constituent Assembly in 1848 and to the Legislative Assembly in 1849. His works include *Etudes numismatiques* (1835) and *Essai sur la numismatique des Satrapies et de la Phénicie* (1846).

LUYS, lụ'ē', Jules Bernard (1828–95). A French alienist, born in Paris and educated there. In 1862 he became physician to the hospitals of Paris, and a year later physician to the Salpêtrière Hospital and the Ivry Asylum. He became a member of the Academy of Medicine in 1877. He wrote: *Des maladies héréditaires* (1863); *Recherches sur le système nerveux cérébro-spinal, sa structure, ses maladies* (1865), crowned by the Institute; *Iconographie photographique des centres nerveux* (1873); *Leçons sur la structure et les maladies du système nerveux* (1875); *Traité clinique et pratique des maladies mentales* (1881), which gained him the Lallemant prize; *Leçons cliniques sur les principaux phénomènes de l'hypnotisme* (1889); *Traitement de la folie* (1894).

LUZÁN, lōō-thän', Ignacio de (1702–54). A Spanish author. He spent his youth in Italy, where he learned Greek and Latin and made himself conversant with several modern languages. His verses in Spanish and his translation of Lachaussée's *Préjugé à la mode* are inferior in importance to his *Poética, ó reglas de la poesía en general y de sus principales especies* (1737), a work in which he proclaims the necessity of correcting the license then prevalent in Spanish literary production by subjecting it to strict classic rules. Although Luzán was not the first to recommend a departure from the then current principles of writing, his courteous manner of maintaining his cause was so effective that, largely as a result of his labors, there was soon established in Spain a school of writers who adopted the principles of Franco-Italian classicism, to which he was himself predisposed because of his wide classical training, his long residence in Italy, and his experience as Secretary of the Spanish Embassy at Paris. Consult: his *Poética*, edition by Eugenio Llaguno y Amírola (2 vols., Madrid, 1789); his "Poesías," in the *Biblioteca de autores españoles*, vols. xxxv, lxi (ib., 1869), and in J. J. López de Sedano, *Parnaso español* (9 vols., ib., 1768–78); L. A. de Cueto, Marqués de Valmar, "La poesía castellana en el siglo XVIII," in *Biblioteca de autores españoles*, vol. lxi (ib., 1869; 3d ed., revised and enlarged, *Colección de escritores castellanos*, vols. xcvii, c, cii, ib., 1893); F.

LUXOR



PYLON AND OBELISK OF RAMESES II.

Fernández y González, *Historia de la crítica literaria desde Luzán hasta nuestros dias* (ib., 1870); M. Marcelino Menéndez y Pelayo, "Historia crítica de las ideas estéticas en España," in the *Colección de escritores castellanos*, vol. xxxviii (ib., 1903).

LUZARCHES, Robert de. See Robert de Luzarches.

LUZ-CABALLERO, lo͞os′kä′ʙá-lyā′rô, José de la (1800–62). A Cuban philosopher and educator, born in Havana. He received his education in Havana (at first studying theology, later law), and was made professor of philosophy in the Seminary of San Carlos there in 1824. In 1832 he was appointed president of the College of Carraguao, and afterward held the chair of philosophy in the College of San Francisco, Havana. He established the College of San Salvador at Havana in 1848, and taught there until his death. He wrote *Impugnación al examen de Cousin* (1840) and made a translation of Volney's *Travels in Egypt and Syria* (1829) and of Siegling's *Public Prisons and their Reforms* (1837). Consult the *Life* by Rodriguez (New York, 1874).

LUZENBERG, lo͞o′zen-bĕrg, Charles Aloysius (1805–48). An American physician, born in Verona, Italy, and educated at Landau and at Weissenburg College, Alsace. He emigrated to the United States in 1819. In 1829 he became attached to the Charity Hospital, New Orleans, and afterward established the New Orleans Medical School. He was in Europe in 1832–34 and was elected a corresponding member of the Paris Academy. He returned to Louisiana in 1834; founded the Society of Natural History in 1839 and the Louisiana Medico-Chirurgical Society in 1843, and was the first president of both. It is asserted that he was the first practitioner in the United States to prevent pitting in cases of smallpox, by the exclusion of light.

LUZERN, lo͞o-tsĕrn′. See Lucerne.

LUZERNE, lû-zĕrn′. A town, including a village of the same name, in Warren Co., N. Y., 22 miles north of Saratoga Springs, on the east bank of the Hudson River, beautifully situated at the edge of the foothills of the Adirondack Mountains and on Lake Luzerne (Map: New York, G 4). It is connected by a bridge with Hadley station on the Delaware and Hudson Railroad, and is a well-known summer resort. There are manufactories of paper and shirts. Pop., 1910, 1185.

LUZERNE. A borough in Luzerne Co., Pa., near the Susquehanna River, 5 miles by rail north of Wilkes-Barre, on the Lehigh Valley and the Delaware, Lackawanna, and Western railroads (Map: Pennsylvania, K 3). It has coal mines, a foundry, drill factories, flour and feed mills, canning factory, silk mill, etc. Pop., 1900, 3817; 1910, 5426.

LUZERNE, lụ′zârn′, Anne César de la (1741–91). A French diplomat, born in Paris. Entering the army at an early age, he saw considerable active service and for some time was an aid on the staff of Marshal Broglie. He returned to civil life after reaching the rank of colonel of grenadiers. As Envoy Extraordinary to Bavaria (appointed 1776), he conducted with great tact the negotiations connected with the succession of Maximilian Joseph to the electorate. His success on this mission led in 1779 to his being appointed to succeed Gérard (q.v.) as Minister to the United States. He arrived in Philadelphia in September. His method of treating with the Congress of the Confederation was not that usually employed by diplomats. Realizing from the first that body's lack of real power, he dealt with the members individually, and is even said to have had some of them in his pay. He soon gained considerable influence, particularly with Robert R. Livingston, Secretary for Foreign Affairs. His intrigues while negotiations for peace were pending resulted in Congress sending instructions to its commissioners at Paris to be guided in their actions by the desires of the French court. He returned to France in 1783, and from 1788 until his death represented France as Ambassador at London.

LUZON, lo͞o-zŏn′, *Sp. pron.* lo͞o-thôn′. The most important and, with the exception of a few islets, the most northern, of the Philippine Islands.

Location and Boundaries. Luzon is situated between lat. 12° 32′ and 18° 39′ N. and between long. 119° 42′ and 124° 8′ E. Its northern extremity, Punta Mayraira, is 217 miles due south of Formosa and 520 miles southeast of Hongkong. The Pacific Ocean proper and the China Sea meet on its north coast. The south coast is washed by a number of channels and seas separating Luzon from the rest of the archipelago, the chief of these being the Strait of San Bernardino, 10½ miles wide, between Luzon and the island of Samar on the southeast, and the Strait of San Bernardino (not the same one as mentioned above), 7½ miles wide, separating Mindoro from the southwest coast.

Area and Configuration. The area of Luzon is officially given as 40,969 square miles, being about one-tenth greater than Mindanao, the second largest island of the Philippines. Its population, according to the census of 1903, was 3,798,507, of which 223,506 are uncivilized; later investigations indicate, however, that this estimate is below the actual numbers. It is thus the most populous as well as the wealthiest island of the archipelago. The shape of the island is extremely irregular. It may be divided into three parts, connected by narrow isthmuses: north Luzon, the main body, with a length from north to south of 270 miles and a width of 130 to 140 miles; central Luzon, 56 by 90 miles, connected with the first by two isthmuses, one on each side of the Laguna de Bay; and south Luzon, a long, narrow, and irregular body stretching 160 miles to the southeast. The coast is very much indented, with numerous large bays, some of which form excellent harbors. The chief bays are: on the west coast, the Gulf of Lingayén and Manila Bay; on the south coast, the bays of Tayabas and Ragay and the port of Sorsogón; and on the east coast, the bays of Albay, Lagonoy, San Miguel, and Lamón.

The principal dependent islands belonging to Luzon are, with their areas in square miles, the Batanes (81) and the Babuyanes (179), two groups of small islands lying north of Luzon, the former being the extreme northern group of the archipelago; Polillo Island (203), near the centre of the east coast; Alabat (60), at the mouth of the Bay of Lamón; Catanduanes (704), off the southeast coast; and a number of smaller groups and islets, chiefly off the east coast.

Geology and Topography. Our knowledge of the geological structure of Luzon is meagre, owing to the natural difficulty arising from the dense vegetation, which leaves the rocks exposed in very few places. The main portion of the island appears to be a remnant of a complex system of mountains which extended to the mainland of Asia. The oldest rocks are probably the gneisses, and serpentines which have been intruded by dikes of diabasic rock. This formation is overlaid by a limestone of Eocene age, and above the limestone is a sandstone which contains coal seams. The southern part of Luzon is covered by volcanic rocks of recent date. Extensive inland beaches containing fossils of existing marine species indicate a recent upheaval, and southern Luzon was probably at no very distant period a separate island.

The mountains of Luzon are included in three principal ranges, which unite in a common nucleus at Mount Caraballo Sur on the northern boundary of the Province of Nueva Ecija in north Luzon. The Sierra Madre Range, 3500 to 4500 feet high, stretches in a continuous chain for 350 miles along the eastern coast, terminating in Cape Engaño, the extreme northeastern point of the island. The Central and North Cordilleras run in a more broken chain parallel with the western coast, and with the Sierra Madre inclose the large basin of the Río Grande de Cagayán. The third great system runs southward along the eastern coast and occupies the whole of south Luzon, terminating in Point Sual at the extreme southeastern end. The principal detached chain is the Cordillera de Cabusilán, running along the western coast from Manila Bay to the Gulf of Lingayén, inclosing between it and the eastern chain the large central basin of the Agno and Pampanga rivers. The average height of these ranges is from 2000 to 4000 feet, Mount Datá of the Central Cordillera rising to a height of 7364 feet, the highest point in Luzon next to the isolated volcano Mayón, which reaches a height of 7916 feet.

There seem to be two distinct lines of volcanic activity in Luzon, the eastern line containing the active volcanoes of Bulsan, Bacón, and Mayón in the southeastern part, Cana at the northeastern extremity, and the extinct Isaróg north of Mayón; the western line contains the active volcano of Taál in west central Luzon and the extinct peaks of Aráyat and Súngay. Mayón is the most active, and 26 eruptions were recorded during the nineteenth century. The last one of great violence occurred in 1897, when, without preliminary warning, streams of lava issued from the crater and destroyed several villages. The lava reached a distance of 7 miles and the ashes covered an area with a radius of over 75 miles. Earthquakes are of frequent occurrence and have on several occasions caused great losses of life and property, notably in 1863, when large parts of Manila were laid in ruins, and in 1880, when the whole island was convulsed with a series of severe shocks. The style of architecture has to be adapted to withstand these disturbances.

Hydrography. Luzon, like all of the East India islands, is exceedingly well watered. The largest river system of the island, as well as of the whole archipelago, is that of the Río Grande de Cagayán, 220 miles long, running north from Caraballo Sur, which is the principal watershed for the three largest rivers of the island, the other two being the Pampanga, running south into Manila Bay, and the Agno, flowing west into the Gulf of Lingayén. The Abra and the Pagsán in the northwestern part are also considerable, and besides these there are numberless short streams running down from the Cordilleras on all sides. Luzon has two large and several smaller lakes. The largest is the Laguna de Bay, 6 miles from Manila, separating central from north Luzon, and communicating with Manila Bay through the Pasig River. The other large lake is Taál, lying southwest of the former in the crater of an extinct volcano, and containing the island volcano of the same name. In the wet season several of the rivers expand into temporary lagoons, the plain of Candaba, east of the Pampanga River, being periodically a lake 24 miles in extent.

Climate (for a general description, see PHILIPPINE ISLANDS). Owing to its higher latitude and to the fact that it is more exposed to the various winds, Luzon enjoys a climate somewhat cooler, less equable, though more agreeable, than that of the southern islands. The annual rainfall, though considerable (amounting at Manila to 75 and even 120 inches), is less than that of the other islands. Luzon lies directly in the path of the typhoons, known locally as *baguíos*, which sometimes work considerable damage to property on shore as well as to shipping. Violent thunderstorms are also frequent.

Flora and Fauna. These do not differ materially from those of the other islands, and are described in the article PHILIPPINE ISLANDS (q.v.). Vegetation is everywhere extremely luxuriant, and large areas are covered with valuable forests.

See PHILIPPINE ISLANDS for history, agriculture, etc.

LU′ZULA (Neo-Lat., from OIt. *luzziola*, *lucciola*, glowworm, from *luce*, light, from Lat. *lux*, light; connected with Gk. *λεύσσειν*, *leussein*, to see, Skt. *ruc*, to shine, OChurch Slav. *lucha*, beam of light, OIr. *lōche*, lightning, OHG. *lioht*, Ger. *Licht*, AS. *lēoht*, Eng. *light*). A genus of about 65 species, belonging to the family Juncaceæ, a family very closely related to the lily family, but distinguished from it by having a scarious perianth instead of a showy or petaloideous one. The species of *Luzula* are grasslike rushes, commonly called wood rushes, and are not to be confused with the rushes of moist ground. In more recent works the name *Luzula* has been abandoned for *Juncoides*, an older name. Our most common species is *Luzula campestris*, which occurs in woodlands almost throughout the United States and Canada.

LUZZATO, lo͝ot-tsä′tô, MOSES ḤAYIM (1707–47). An Italian Jewish cabalist and poet. He was born at Padua; was educated in Latin and other languages; and made a thorough study of the mysteries of Isaac Luria (q.v.). He composed 150 hymns that were modeled so closely on the biblical Psalms as to offend many rabbis of the time. He produced several dramas, including *Shimshon u-Felistim* (1724); *Migdal 'Oz* (1727; first published, 1837); *Le-Yesharim Tehillah* (c.1743); wrote also many cabalistic works, for which he was persecuted by the learned rabbis of Venice; and, after his emigration in 1735 to Amsterdam, published the *Mesillat Yesharim* (1740), a treatise on religious ethics.

LUZZATTI, lo͞o-tsät′tē, LUIGI (1841–). An Italian statesman and financier, born in Venice of a Jewish family. He taught for a time in the Istituto Tecnico in Milan and in 1867 became professor of political economy and constitutional law at Padua. In 1870 he was elected to the House of Deputies and soon became prominent in matters of finance. In 1900 he became professor of constitutional law at the University of Rome. He was Minister of the Treasury in Rudini's cabinet in 1891–92 and 1896–98, under Giolitti in 1903–05, and in Sonnino's short-lived ministry, February to May, 1906. He was the president of the ministry in 1910, with the portfolio of Minister of the Interior. He was an active philanthropist and wrote much on financial topics. Among his works are *La diffusion du credit et les banques populaires* (1863); *L'Eglise et l'etat en Belgique avec applications à l'Italie* (1866); *La liberté de conscience et de science* (1910). After 1866 he was also a collaborator on the *Nuova antologia di scienze, lettere, ed arti.*

LUZZATTO, lo͞o-tsät′tō, SAMUEL DAVID (1800–65). The most distinguished Italian Hebrew scholar and writer of the nineteenth century. He was born in Triest, received an academic education, and was professor of biblical exegesis in the Rabbinical School at Padua from its foundation in 1829 till his death. He was regarded as one of the chief restorers of Hebrew literature. His published works, written in Hebrew or Italian, include: *Oheb Ger* (notes on the Targum of Onkelos and a short Syriac grammar, 1830); *Wikkuah 'al ha-Ḳabbala* (dialogues on the cabala and on the antiquity of punctuation, 1852); *Grammatica della lingua ebraica* (1853); *Sefer Yesha'yohu* (Book of Isaiah, with an Italian translation and a Hebrew commentary, 1855–67); *Elementi grammaticali del caldeo biblico e del dialetto talmudico babilonese* (1865); *Ha Mishtaddel* (scholia to the Pentateuch, 1849); *Introduzione critica ed ermeneutica al Pentateuco* (1870).

LUZZI, lo͞o′tsė, PIETRO. See MORTO DA FELTRE.

LVOFF, l'vŏf, ALEXEI FEODOROVITCH (1798–1870). A Russian musician, composer of the national hymn. He was born at Reval, where his father was a well-known musician. He was educated for the army, and after graduating from the military technical institute he received a commission in the Imperial Guards. Meanwhile he had educated himself thoroughly in music and had become distinguished for his musical attainments. In 1836 he was appointed conductor of the Imperial Court Choir, succeeding his father, a position which he held until 1855. His instrument was the violin, on which he was an excellent performer; besides which he was a student of Old Russian Church song and of Russian folk music. In 1859 he published an essay *On the Free and Non-Symmetrical Rhythm of Old Russian Church Song.* His compositions include four operas, the only successful one of which was *Undine* (1846); Church music; part songs; arrangements of Russian folk songs; and a considerable number of pieces for the violin. He was commissioned by the Czar to compose the music to the words of the national hymn, which had been written by Zhukovski (1833). He died on his family estate in the Government of Kovno.

LYALL, lī′al, SIR ALFRED COMYN (1835–1911). An English administrator and author, son of the Rev. Alfred Lyall, born at Coulston, Surrey. He studied at Eton, entered the Bengal Civil Service as assistant magistrate and collector in the Northwest Provinces of India, in 1873 was appointed Home Secretary to the government of India, and from 1882 to 1887 was Lieutenant Governor of the Northwest Provinces. In 1887 he was appointed a member of the council of the Secretary of State for India. He founded the new University of Allahabad. On his return to England in 1887 he filled a distinguished place in English society. Cambridge invited him to lecture in 1891 and Oxford in 1907, and he received honorary degrees from both these universities. In politics he was a Liberal Unionist and free trader. He wrote: *Asiatic Studies* (1882–99); *Life of Warren Hastings,* in the "English Men of Action Series" (1889); *Rise of the British Dominion in India* (1893); *Alfred Tennyson,* in the "English Men of Letters Series" (1902); *Lord Dufferin: The Life of the Marquess of Dufferin and Ava* (2 vols., 1905). Consult H. M. Durand, *Life of the Right Honorable Sir Alfred Comyn Lyall* (New York, 1913).

LYALL, SIR CHARLES JAMES (1845–1920). An English Orientalist, educated at King's College School, King's College, London (of which he became fellow), and Balliol College, Oxford. Entering the British Civil Service in 1867, he thereafter held office as Undersecretary to the government of the Northwest Provinces, Undersecretary to the government of India, judge and commissioner of the Assam valley districts, secretary in the Home Department of the Indian government, Chief Commissioner of Assam and then of the Central Provinces of India, and secretary of the Judicial and Public Department of the India Office (1898–1910). Honorary degrees were given him by Edinburgh, Oxford, and Strassburg. He wrote: *Translations of Ancient Arabic Poetry* (1885); *Ten Ancient Arabic Poems* (1894); and an edition of two ancient Arabic *divans,* with translation (1913).

LYALL, EDNA (1857–1903). The pen name of Ada Ellen Bayly, an English author. She was born at Brighton, and in 1879 published her first novel, *Won by Waiting,* a juvenile story, which had run through 13 editions by 1894. This was followed by a series of quiet, purposeful works of fiction, including: *Donovan* (1882), *We Two* (1884), *In the Golden Days* (1885)—these three novels were her best books; *Knight Errant* (1887); *Derrick Vaughn* (1889); *A Hardy Norseman* (1889); *To Right the Wrong* (1892); *Doreen* (1894), an Irish novel, expressing ardent Home Rule convictions; *The Autobiography of a Truth* (1896); *Wayfaring Men* (1897); *Hope the Hermit* (1898); *In Spite of All* (1901); *The Hinderers* (1902). Consult Escreet, *Life of Edna Lyall* (London, 1904). Miss Lyall was a skillful novelist, particularly happy in her portraiture of girls. A zeal to champion her liberal political views, and to crusade against oppression and injustice, appreciably interfered, however, with the free exercise of her artistic gifts.

LYAUTEY, lī-ō′tĕ, (LOUIS) HUBERT (1854–). A French general and military writer, born at Nancy. He was first stationed in Indo-China, and then at Madagascar, where he pacified and organized the southern part of the island. For some time he was stationed at Oran. He became a Grand Officer of the Legion of Honor and was elected to the French Academy in 1912. His writings include: *Le rôle social de l'officier* (1891); *Du rôle colonial de l'armée* (1900); *Dans le sud du Madagascar* (1903); and contributions to military journals.

LYCABETTUS, lĭk′ȧ-bĕt′tụs (Lat., from Gk. *Λυκαβηττός, Lykabēttos*). The modern mountain of St. George, a conical hill of bluish-gray limestone, northeast of Athens, in which the range of hills by which the Athenian plain is divided terminates. Its summit, 910 feet above the sea, is crowned by a chapel of St. George, from which commanding views are obtained of the city and surrounding country. Most of the modern houses of Athens are built of the stone quarried from the hill, from which much of the material for the ancient structures was also obtained. On the southwest portion of the hill was a cistern in which the aqueduct built by Hadrian and Antoninus ended. The aqueduct was repaired between 1855 and 1869, and now furnishes the water supply of the city.

LYCÆ'A (Lat., from Gk. Τὰ *Λύκαια*, *Ta Lykaia*). A festival of Zeus, celebrated in ancient times on the Lycæus Mons. See LYCAON.

LYCÆ'US MONS (Lat., from Gk. *Λύκαιον Ὄρος*, *Lykaion Oros*, modern Diophorti). A mountain in Arcadia, sacred in ancient days to Zeus Arcadios. (See JUPITER.) In 1904 some well-preserved remains were discovered of the hippodrome (q.v.), once used in the Lycæa, or festival of Jupiter, celebrated on this mountain. Consult Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909). See LYCAON.

LY'CANTHRO'PIA. See WEREWOLF.

LYCA'ON (Lat., from Gk. *Λυκάων*, *Lykaōn*). A legendary king of Arcadia, son of Pelasgus and Melibæa, or Cyllene. He had many sons (some say 50, others only 22), whose names are obviously merely the eponyms of founders of Peloponnesian cities. According to the tradition of the Arcadians, he first introduced the worship of Zeus Lycæus, founding Lycosura (q.v.), near the top of Mount Lycæus. (See LYCÆUS MONS.) He, however, in his savage ignorance offered human sacrifices, and therefore at the very altar was turned into a wolf. Another version dwells on the crimes of Lycaon and his sons, which finally brought Zeus from Olympus to investigate the reports. The people felt that a god was in their midst; but Lycaon scornfully set before his visitor the flesh of a child. In anger Zeus slew all the family with the thunderbolt, save one son, or transformed Lycaon into a wolf, and slew the sons. According to the story repeated by Ovid, *Metamorphoses*, i, 163–451, Zeus further punished the world by overwhelming it in a great flood. (See DEUCALION.) The transformation story is evidently due to etymologizing, by which *Λυκάων* was connected with *λύκος*, a wolf, but it seems probable that human sacrifices were long offered to Zeus Lycæus on the top of the mountain. The exact relation of Lycaon to this cult is not clear, but it is by no means improbable that he was originally a god, perhaps a wolf god worshiped with savage rites, perhaps a light god who was displaced, like so many other lesser gods, by the greater god, Zeus, and thus sank to a legendary hero of evil character. See JUPITER; WEREWOLF. Consult: Walter Immerwahr, *Die Kulte und Mythen Arkadiens*, vol. i (Leipzig, 1891); Farnell, *Cults of the Greek States*, vol. i (Oxford, 1896); Otto Gruppe, *Griechische Mythologie und Religionsgeschichte*, vol. ii (Munich, 1897); Wilhelm Mannhardt, *Wald- und Feldkulte*, vol. ii (Berlin, 1905).

LYCAON. See HUNTING DOG.

LYCAONIA, lĭk'ā-ō'nĭ-ȧ (Lat., from Gk. *Λυκαονία*, *Lykaonia*). In ancient geography, a country forming part of the table-land of Asia Minor, 3000 feet in height (Map: Rome, F 3). It was bounded on the east by Cappadocia, on the north by Galatia, on the west by Pisidia and Phrygia, and on the south by Cilicia. Its capital was Iconium (see KONIEH), and Derbe and Lystra were among its cities. It was a mountainous region, supporting asses and sheep. One of the great highways from Sardis and Ephesus to the Cilician Gates (q.v.) ran through Lycaonia: along this route the cities grew up. Nominally Lycaonia was part of the Persian Empire; but its warlike peoples were in reality largely independent.

When the Romans defeated Antiochus the Great (q.v.) they gave Lycaonia to Eumenes II of Pergamos. Later, having formed, since 129 B.C., a part of the domains of the kings of Cappadocia, it was, in 41 A.D., incorporated in the Roman Province of Galatia (q.v.). It was made a separate province in the early fourth century. Later it fell under the Seljuk rulers. See DERBE; GALATIA; KONIEH; LYSTRA. Consult: Sir W. M. Ramsay, *Historical Geography of Asia Minor* (London, 1890); id., *Cities of St. Paul* (New York, 1907); and the article "Lykaonien," in Friedrich Lübker, *Reallexikon des classischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

LYCÉE. See LYCEUM; FRANCE, *Education*.

LYCE'UM (Lat., from Gk. *Λύκειον*, *Lykeion*). The largest of the gymnasia of ancient Athens, which received its name from the temple of Apollo Lycius, that stood near by. The Lyceum was situated in the eastern suburb of the city, south of the Cynosarges (q.v.), and not far from the city wall. Socrates used to frequent the spot, and here, in the groves and walks that belonged to the place, Aristotle at a later period gave instruction in philosophy. (For the gymnasia at Athens, see EDUCATION, *Historical Sketch of the Theory of Education.*) Hence the more recent meanings of the word have been derived: a school where philosophy is cultivated; an intermediate or secondary classical school, as distinct from a college (France: the word there is *lycée*); a building used for lectures and the like.

LYCHNIS, lĭk'nĭs (Lat., rose of a bright-red color, from Gk. *λυχνίς*, a plant with a scarlet flower; connected with *λύχνος*, *lychnos*, lamp). A genus of plants of the family Caryophyllaceæ, including about 35 species, distributed through north temperate and Arctic regions. European species, which are in common cultivation in the United States and have escaped, are as follows: *Lychnis Flos-cuculi* (cuckoo flower, ragged robin), *Lychnis alba* (white campion), *Lychnis dioica* (red campion), *Lychnis chalcedonica* (scarlet lychnis, fire balls),

LYCHNIS.

Lychnis coronaria (mullein pink). The best-known indigenous forms in North America are *Lychnis drummondii*, from Minnesota and Nebraska west to the Pacific, and the two Arctic species, *Lychnis apetala* and *Lynchis affinis*. The very well-known *Lychnis githago* (corn cockle), introduced from Europe, common in grain fields and along roadsides, has now been transferred to the genus *Agrostemma*. See Plate of CRANBERRY, ETC.

LYCIA, lĭsh′ĭ-ȧ (Lat., from Gk. *Λυκία*, *Lykia*). A country on the southwestern coast of Asia Minor, bounded on the northwest by Caria, on the north by Phrygia, on the northeast by Pisidia, and on the east by Pamphylia (Map: Greece, Ancient, F 3). Some scholars say the country is mentioned in the Tell el Amarna tablets, as early as 1400 B.C.; the Lycians are there called *Lukki*. The ancient inhabitants are said to have been two races called the *Solymi* and the *Tramilæ* or *Termilæ*. Of these the former seem to have been driven from the coast to the mountain plateau of Milyas in the north by the latter, who appear to have been of the Indo-European race and to have entered the country by sea. They early developed a city life and stood in close connection with the Greeks. Though the Lycians seem to have maintained their independence against the Lydians, they were subdued by the Persians under Harpagus, the general of Cyrus, after an heroic resistance during which the inhabitants of the chief city, Xanthus (q.v.), burned their citadel, with their wives, children, and property, rather than surrender. The Persians attached the country to the Carian satrapy, but seem to have left the old forms of government undisturbed. The Lycians seem to have formed a league of cities governed by a body of nobles, with a chief in every city whose name appears on the coins. The chief cities were: Xanthus; Patara, with a temple of Apollo; Pinara, and Tlos in the west, on the hills along the valley of the Xanthus; Telmessus, the seat of an oracle, further to the northwest, while to the south and the east, near the coast, were Myra, Limyra, and Olympus. Persian influence was strong in the ruling families, but the civilization and especially the art were markedly Hellenic. Even in the sixth century B.C. the Harpy tomb of Xanthus shows the work of Greek artists, the reliefs of Gölbashi (Trysa) are a reflection of the paintings of Polygnotus, and the Nereid monument reproduces the Greek art of the fourth century B.C. After the Persian wars the Lycian cities were for a time enrolled in the Delian League, but seem to have returned to Persian rule before 440 B.C. Early in the fourth century they for a time attempted to assert their independence of Persia, but were again reduced. With the rest of Asia Minor, Lycia was subdued by Alexander the Great, and later came under the rule of the kings of Syria. The Romans first gave it to the Rhodians, but later recognized its independence, and the Lycian league of 23 cities, with a *Lyciarch* as its chief officer, continued to exist, with some vicissitudes, until Vespasian finally united the district to Pamphylia. The mountainous region abounds in interesting ruins of the past. The antiquities, however, had received little attention till Sir Charles Fellows (q.v.), about the year 1838, pointed out their interesting character. In 1842 Spratt and Forbes explored the interior and made a good map showing its physical features. Since that time it has been more carefully explored and studied. The explorations have shown the existence of a native architecture, especially in the rock-cut tombs; many theatres, some of considerable size, prove the Greek influence on the country. Among the monuments a prominent place is held by the inscriptions in the native language, in a peculiar alphabet. (See LYCIAN LANGUAGE.) Lycia has no importance in early Christian history.

Bibliography. The history is treated by Treuber, *Geschichte der Lykier* (Stuttgart, 1887). The monuments are described in Fellows, *Account of Discoveries in Lycia* (London, 1841); Spratt and Forbes, *Travels in Lycia* (London, 1847); and especially in Benndorf, Niemann, Petersen, and Luschan, *Reisen im südwestlichen Kleinasien* (Vienna, 1884 and 1888). Consult also: Benndorf and Niemann, *Das Heroon von Gjölbaschi-Trysa* (Vienna, 1889); Perrot and Chipiez, *Histôire de l'art dans l'antiquité*, vol. v (Paris, 1890), and, in the English translation of the preceding work, *History of Art in Phrygia, Lydia, Caria, and Lycia* (New York, 1892); Sophus Bugge, *Lykische Studien* (Christiania, 1897 et seq.); Alfred Torp, *Lykische Beiträge* (ib., 1898); Vilhelm Thomsen, *Etudes lyciennes* (Copenhagen, 1899). For the coins, consult: G. F. Hill, "Coins of Lycia, Pamphylia, and Pisidia," in *Catalogue of the Greek Coins in the British Museum*, vol. xviii (London, 1897). The inscriptions have been for the first time fully collected and edited under the auspices of the Vienna Academy of Sciences, as the first volume of a collection of the inscriptions of Asia Minor, *Tituli Asiæ Minoris:* vol. i, *Tituli Lyciæ Lingua Lycia Conscripti*, edited by E. Kalinka (Vienna, 1901). The work contains a full bibliography and supersedes all previous publications, though for detailed discussions it is still necessary to compare earlier articles in the philological and archæological journals.

LYCIAN LANGUAGE. The native language of the ancient Lycians is only imperfectly known. In 1838 and 1840 Fellows discovered and copied 30 inscriptions in Lycia. Among these, one found at Xanthus covered the four sides of a large obelisk having, in addition to 238 lines of Lycian, a Greek epigram of 12 hexameters. The others were all tomb inscriptions, one of them, found at Limyra, being a bilingual, Greek and Lycian. Another bilingual found at Antiphellus was published by Grotefend in 1842. The same year Daniell and Spratt and Forbes copied 36 Lycian inscriptions, among them two bilinguals from Lamisii and Tlos. Schönborn in 1841–42 and again in 1851 gathered a rich collection, published after his death by Schmidt. A number of Lycian coins were found and published by Fellows in 1855. The bilingual decree of Pixodarus, Carian ruler (340–335 B.C.), was published by Schmidt in 1869. Most of the inscriptions have been found at Limyra; others come from Xanthus, Antiphellus, Myra, Telmessus, Cadyanda, Cyanæ, Pinara, Rhodiopolis, Sura, and Candyba. They are written in an alphabet which has borrowed the Greek letters and adopted new signs for a number of sounds. The forms of the Greek letters show a greater resemblance to the Doric than to the Ionian. If this speaks for a higher age, the presence of χ and ϕ, unless it is a later acquisition, would indicate a comparatively late origin of the Lycian alphabet. Various reasons have been adduced by Sharpe, Lassen, Savelsberg, Lagarde, Bugge, Torp, and Pedersen for the opinion that the Lycian is an Iranian language, akin to the Avestan and the old Persian and also to the Armenian. *P* is supposed to have changed into *h*, as in Armenian, and as *f* into *h* in the Kurdish (q.v.); though, on the other hand, *s* is not changed into *h* in the Lycian. But, through Kretschmer, Beloch, Kalinka, Eduard Meyer, and others, the non-Iranian character of the Lycian has in recent times come to be very generally recognized. According to Herodotus (i, 173; vii, 92), the Lycians came from Crete; and it is not improbable that the Lukki of the Tel el Amarna tablets and the Lukiu of the Egyptian inscriptions had their home on that island, whence they invaded Asia Minor in the twelfth century B.C. Their language is now supposed to have been akin to the Carian, the Lydian, the Pisidian, the Lycaonian, and the Cilician. The time of the inscriptions can be approximately fixed by their general similarity and by the known date of Pixodarus. Whether Savelsberg is correct in identifying Darius II and Artaxerxes III on the Xanthus monument cannot yet be determined with certainty. But his theory that the obelisk celebrates a great effort to throw off the Persian yoke in the generation preceding Alexander, though somewhat bold, is at least plausible.

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LYCIDAS, lĭs'ĭ-dȧs. 1. A shepherd mentioned in the Seventh Eclogue of Vergil. 2. A poem by Milton (1638), in commemoration of the death of Edward King, the poet's friend, who was drowned in 1637.

LYCIUM, lĭs'ĭ-ŭm. A genus of plants, belonging to the family Solanaceæ, including about 75 species, widely distributed in temperate and warm regions, about 15 species being indigenous in western North America. The species in general are called box thorns. They are shrubs or woody vines, often spiny, with small alternate and entire leaves, and usually with smaller ones fascicled in the axils. In the Eastern States the only form is the introduced *Lycium halimifolium* (matrimony vine). In this species the purplish flowers are solitary or clustered in the axils of the leaves and are followed by orange-red berries.

LYCK, lĭk. A town in the Province of East Prussia, Germany, near the Russian frontier, 100 miles southeast of Königsberg, on a river and lake of its own name (Map: Germany, K 2). It has an old castle (built on an island by the Teutonic Knights and once used as a prison), a Gymnasium, and a teachers' seminary. Its industries include the manufacture of machinery, leather, mineral waters, furniture, cement goods, bricks, lumber, and oil. Pop., 1900, 11,419; 1910, 13,428. During the European War of 1914 Lyck was captured by the Russians. They were later compelled to evacuate it by the counter attacks of the Germans. See WAR IN EUROPE.

LYCOMEDES, lĭk'ȯ-mē'dēz. King of the island of Scyros, son of Apollo and Parthenope, father of Deïdameia, and grandfather of Neoptolemus. To his care Thetis intrusted her son Achilles (q.v.), disguised in feminine garments, in order to prevent him from taking part in the Trojan War. When Theseus, driven from the throne of Athens, sought his protection, Lycomedes treacherously caused his death by throwing him down a precipice.

LY'CON (Lat., from Gk. *Λύκων*, *Lykōn*) (c.300–226 B.C.). A Greek philosopher, born in the Troad. He was one of the successors of Aristotle and Theophrastus as the head of the Peripatetic school (270–226 B.C.). So distinguished was he for his charm of person and mind and for his eloquence that his followers prefixed the letter gamma to his name, making it *Γλύκων* (i.e., the sweet). Consult: Ulrich von Wilamowitz-Moellendorf, *Antigonos von Karystos* (Berlin, 1881); Walter Pomtow, *Göttinger Gelehrte Anzeiger* (Göttingen, 1913); Friedrich Ueberweg-Prächter, *Grundriss der Geschichte der Philosophie* (10th ed., Berlin, 1914).

LY'COPHRON (Lat., from Gk. *Λυκόφρων*, *Lykophrōn*) (flourished third century B.C.). A Greek poet and grammarian. Born at Chalcis in Eubœa, Lycophron lived in later life at Alexandria, where, under Ptolemy Philadelphus (283–247 B.C.), he was distinguished as one of the Pleiad, or band of seven tragic poets. He was intrusted with the arrangement of that part of the Alexandrian library which had to do with comedy; he composed, in the course of this work, a treatise *On Comedy*. Suidas gives the titles of 20 of his tragedies; according to Tzetzes, he wrote 46 or 56 pieces. The fragments of these are published by Nauck (*Tragicorum Græcorum Fragmenta*, 2d ed., Leipzig, 1889). Only his *Cassandra* or *Alexandra* (Κασσάνδρα or Ἀλεξάνδρα), an iambic poem of 1474 verses, is preserved. The story is simple—in an oracular and obscure style Cassandra prophesies the downfall of Troy and the subsequent adventures of the Trojan and Argive heroes. Especial attention is paid to the founding of cities. Two passages even foretell the settlement of Æneas in Latium, but these are probably later interpolations. The best edition is that of Holzinger, with a German translation and a commentary (Leipzig, 1895). There is an English translation by Yorke (Cambridge, 1806). Consult Ulrich von Wilamowitz-Moellendorf, *De Lycophronis Alexandra* (Göttingen, 1884), and Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii (5th ed., Munich, 1913).

LY'COPODIA'LES (Neo-Lat. nom. pl., from *λύκος*, *lykos*, wolf + *πούς*, *pous*, foot; so called from the appearance of the roots). One of the great divisions of fern plants (Pteridophytes) and usually regarded as the one including the most primitive Pteridophytes. Popularly they are called club mosses, and the majority of them belong to two genera, *Lycopodium* and *Selaginella*. They differ strikingly in habit from the other Pteridophytes, in that the aërial body consists of slender branching stems thickly clothed with very numerous small leaves. Many of the more delicate species of *Selaginella* resemble coarse mosses and are common in greenhouses as decorative plants. In the Carboniferous period (coal measures) the club mosses included tree forms, some of which were very bulky and formed a conspicuous part of the forest vegetation. Only the smaller forms have survived, about 500 species being represented in the flora of to-day. In temperate and colder regions the coarser species of *Lycopodium* prevail, often called ground pines as well as club mosses; while in the tropics the more delicate and more numerous species of *Selaginella* are chiefly displayed. Aside from the mosslike habit, the most conspicuous feature of the group is the strobilus. The word literally means 'cone' and refers to a terminal, conical or cylindrical, sporangium-bearing structure. It is the presence of these clublike bodies at the ends of the mosslike branches which has suggested the name club mosses. The strobilus is composed of a series of closely overlapping bracts (sporophylls), each one of which bears at its base upon the upper side a single sporangium, in which the spores are produced. This strobilus is the same structure as that which in the pines and their allies is denominated cone.

A very important fact in connection with the club mosses is that the species of *Selaginella* are heterosporous. When a microspore germinates, it produces a very small male plant (male gametophyte), so small that it does not escape from the spore. This small and concealed male plant develops a sex organ (antheridium) which produces sperms. The sperms of club mosses differ from those of other Pteridophytes in that they are very small and have only two cilia for locomotion. When a megaspore germinates, it produces a small female plant (female gametophyte), which remains within the megaspore, but ruptures it on one side, growing out a little beyond it. In this exposed part of the little female plant sex organs (archegonia) are developed, in each of which an egg is formed. To these eggs the sperms have access and fertilize them. The resulting fertilized egg (oöspore) then germinates and produces the ordinary leafy club moss, which is a sexless plant (sporophyte). The habit of some species of *Selaginella* which do not shed the megaspore is so suggestive of seed plants that many think the seed plants, or at least some of them, may have been derived from the club mosses.

The quillworts (species of *Isoëtes*) are now associated with the club mosses in Lycopodiales, though for a long time their position was under discussion. They look like very slender tufted grasses growing in water, the habit being very unlike that of the club mosses. In many important particulars, however, the resemblance is striking, the most conspicuous being the single spore case (sporangium) at the base of each spore-bearing leaf. Quillworts are also heterosporous, as are the species of *Selaginella*. The most important difference is in the sperm, which is large and bears many cilia, as in the ordinary ferns. See LEPIDODENDRON; PTERIDOPHYTES; ALTERNATION OF GENERATIONS; OÖSPORE; SPERMATOPHYTE.

LY'COPO'DIUM. A genus of club mosses. See LYCOPODIALES.

LYCOP'OLIS. A city of ancient Egypt. See ASSIUT.

LYCOSU'RA (Lat., from Gk. *Λυκόσουρα*, *Lykosoura*). The name of a town in Arcadia (q.v.), which, tradition said, was the oldest city in Greece; it was founded by Lycaon (q.v.). It was famous for its temple of Despoina, the Queen (Persephone), which contained a colossal group, showing Despoina and Demeter seated, and Artemis and a Titan, Anytus, standing beside them. This group was made by the sculptor Damophon (q.v.). Large parts of this group and remains of the temple were found in 1889. The place is known now as Palæokastro or Siderokastro. Consult *Πρακτικά τῆς 'Αρχαολογικῆς 'Εταρίας* (1896), and G. Dickens, in *British School at Athens, Annual*, vols. xii–xiii (London, 1906–07).

LYCUR'GUS (Lat., from Gk. *Λυκοῦργος*, *Lykourgos*). According to a common ancient tradition, a Spartan lawgiver and political reformer, who lived in the ninth century B.C. and was a son of King Eunomus. The legend declares that he exiled himself from Sparta in order to avoid the suspicion of aiming at the throne of his infant nephew, Charilaus, and that he traveled in Greece, Asia, and Egypt, and studied the laws of Minos in Crete. Returning home, he found Sparta in civil commotion and at war with her neighbors. He undertook to introduce a new constitution and to establish a new social order, which should make of Sparta a preëminently military state. How much of what is traditionally attributed to Lycurgus was actually his work it is not easy to define with accuracy. See SPARTA. Consult the life by Plutarch; Meyer, "Lykurgos von Sparta," in *Forschungen zur alten Geschichte*, vol. i (Halle, 1892); Nusselt, *Das Lykurgproblem* (Erlangen, 1898); Ernst Kessler, "Plutarchs Leben des Lykurgos," in *Quellen und Forschungen zur alten Geschichte*, vol. xxiii (Berlin, 1910).

LYCURGUS (c.395–323 B.C.). A Greek orator, included by the Alexandrian critics in the canon of the 10 Attic orators. He was born at Athens and spent his life there. He is most famous for his management of the finances of Athens after the defeat of Chæronea (q.v.); in fact, he was the only statesman of antiquity who displayed real knowledge of finance. For 12 years (338–326) he controlled the revenues, and under his administration many new buildings were built and many old buildings were remodeled or completed. These included the arsenal of Philo, the Panhellenic Stadion, the Lyceum, and the theatre of Dionysus. He proposed also a law calling for the erection in the theatre of statues of Æschylus, Sophocles, and Euripides, and for the careful editing and preservation in the state archives of their tragedies. In politics Lycurgus favored the anti-Macedonian policy of Demosthenes (q.v.), and he was one of the orators whose surrender Alexander demanded after the destruction of Thebes (335), although this demand was afterward withdrawn. Fifteen years after his death, when the democratic party came into power, a decree was passed by the Athenians that public honors should be paid him; a bronze statue of him was set up in the Ceramicus (q.v.). The ancients possessed 15 speeches of Lycurgus, two of which were written in defense of his financial policy. Only one has been preserved, the speech *Against Leocrates*. The speech, together with the fragments of Lycurgus, has been published by Blass (Leipzig, 1899).

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LYD'DA (Lat., from Gk. *Λύδδα*, Heb. *Lōd*, renamed *Diospolis* in the second century A.D.). A city of Palestine, about 10 miles southeast of Joppa (Map: Palestine, B 4). According to 1 Chron. viii. 12, it was founded by Shamer or Shamed of the tribe of Benjamin, the historical foundation for which is probably that a Benjamite clan was settled there. Some of its inhabitants must have been taken to Babylonia, for Lodites appear in the lists of those who returned under Zerubbabel, Ezra, and Nehemiah (Ezra ii. 33; Neh. vii. 37, xi. 35). It was the place where St. Peter healed Æneas and received the request to proceed to Joppa on behalf of Dorcas (Acts ix. 32–43). Lydda is mentioned by Josephus (*Wars*, iii, 3, 5) as one of the 11 toparchies or districts over which Jerusalem presided. Its inhabitants suffered considerably during the various struggles of the Jews against Roman supremacy. About the time of Vespasian Lydda was a home of Jewish learning and became the seat of a bishopric early in Christian times. Outside of its biblical associations the town is famous for its connection with St. George, who is said to have been born and buried there. A church was built over his tomb, which has been repeatedly destroyed and rebuilt. It is now in possession of the Greeks, by whom it has been restored. Lydda was situated on the road from Joppa to Jerusalem, and it is now a station on the railroad. In ancient times it was also on the great caravan route between Babylon and Egypt. The modern village on the ancient site still preserves the ancient name Ludd.

LYDD'ITE. A high explosive, receiving its name from Lydd in Kent, the place of its first manufacture. Chemically it is picric acid ($C_6H_2(NO_2)_3OH$). It is obtained by the reaction of carbolic and nitric acids, is a crystalline solid, bright yellow, and bitter to the taste. It is difficult to detonate and is safely melted and poured into shells. Its fumes on bursting are suffocating. It is used as a bursting charge for shells. It is supposed to kill by shock, or suffocate by its fumes. It is a stable compound under changes of temperature and is more effective than black powder against masonry, sand, or earth. It was extensively used against the Boers in the War of 1899–1902, but, owing to the character of the positions usually selected by the Boers, it did not prove very destructive. The explosives used by the various nations as *bursting charges* are all composed principally of picric acid or its derivatives. The French melinite, the English lyddite, the Japanese shimose powder, are examples. The composition of dunnite, or explosive D, used in the United States service, is not known. It is safer to handle than black powder. See EXPLOSIVES.

LYDEK'KER, RICHARD (1849–1915). An English naturalist. He was educated at Trinity College, Cambridge, in 1874 was appointed to the staff of the Geological Survey of India, and during his Indian residence (1874–82) made particular study of the series of vertebrate fossils from the Siwalik Hills. In 1884 he undertook for the British Museum the preparation of catalogues of the fossil mammalia, amphibia, reptilia, and birds in that institution. He also visited the Argentine Republic in 1893 and 1894 to study the fossil mammals contained in the Plata Museum. Elected a fellow of the Zoölogical Society in 1880 and in 1898 a member of its council, he also became a fellow of the Geological Society in 1883, a member of the council of the organization in 1886 and 1893, and a vice president in 1894. He wrote numerous works, including: *Catalogue of the Remains of Siwalik Vertebrata Contained in the Geological Department of the Indian Museum* (1885); *Catalogue of the Remains of Pleistocene and Prehistoric Vertebrata in the Geological Department of the Indian Museum, Calcutta* (1886); *An Introduction to the Study of Mammals, Living and Extinct* (1891); *The Royal Natural History* (1893–96); *A Geographical History of Mammals* (1896); *The Deer of All Lands: A History of the Family Cervidæ, Living and Extinct* (1898); *Wild Oxen, Sheep, and Goats of All Lands, Living and Extinct* (1898); *Great and Small Game of India, Burma, and Tibet* (1900) and *Great and Small Game of Europe, Western and Northern Asia, and America* (1901); *Mostly Mammals: Zoölogical Essays* (1903); *Sir William Flower*, in "English Men of Science Series" (1906); *The Sportsman's British Bird Book* (1908); *The Ox and its Kindred* and *The Sheep and its Cousins* (1912).

LYDGATE, lĭd'gât, JOHN (c.1370–c.1451). An English poet. He was educated at Oxford and ordained a priest in 1397; traveled considerably in France; entered the Benedictine Order, and conducted a school of rhetoric and philosophy at the monastery of Bury St. Edmunds. An admirer and imitator of Chaucer, he wrote in 10-syllabled couplets an additional Canterbury Tale, called *The Storie of Thebes* (between 1420 and 1422) and represented as having been narrated by the author after joining the pilgrims on their return. His other voluminous works include *The Troy Book* (between 1412 and 1420) and *The Falls of Princes* (c.1430), both based on Middle-Age Latin originals. His work, largely bungling in versification and prosy in detail, has eminent historic value, not only as the chief literary monument of the obscure post-Chaucerian period, but as the repository of information on contemporary manners. A selection from the lesser poems was made by Halliwell-Phillipps in 1840. Consult the poems of Lydgate published by the Early English Text Society, and Furnival's *Political Poems*, published by the same society; also Henry Bergen's edition of *Troy Book* (Oxford, 1906).

LYD'IA (Lat., from Gk. *Λυδία*). In ancient geography, a country of Asia Minor, bounded on the west by Ionia, on the south by Caria, on the east by Phrygia, and on the north by Mysia (Map: Greece, Ancient, F 2). Its earliest Greek name is said to have been Mæonia. The inhabitants are said to have been closely akin to the Phrygians and the Mysians and in that case were probably Indo-Europeans, though the names of the kings of Lydia suggest rather Semitic origin. The country was mountainous in the south and west, the principal range being that of Tmolus. Lydia was celebrated for its fruitful soil and for its mineral wealth, particularly for the gold of the river Pactolus and of the neighboring mines. The people were active traders and early developed considerable wealth and luxury. Coined money seems to be their invention (the oldest-known coins are electrum coins of the Mermnadæ dynasty: see NUMISMATICS, *Ancient Coins—Origin—Classification*), and in religion and music they strongly influenced the Greeks, from whom in turn they received their alphabet, and of whose customs and gods, and especially of the oracle at Delphi, their kings were great admirers. The earliest dynasties, according to Herodotus, were the Atyadæ and the Heraclidæ. Of these the first seems purely mythical, and the second is perhaps a reminiscence of the rule of Hittite conquerors.

Lydia attained its highest prosperity under the third dynasty of the Mermnadæ (c.689–546 B.C.), which was founded by Gyges (q.v.), a member of a noble Lydian family, around whom has gathered a mass of myth. It seems clear that he was an energetic ruler, who extended his power in Asia Minor and especially sought to open a way to the coast by establishing his suzerainty over the Greek colonies on the Ægean. His progress was checked by the Cimmerian invasion (see CIMMERIANS), which so seriously imperiled his safety that he sought the help of the Assyrian King, Asurbanipal, to whom he paid tribute (c.660 B.C.). Later he fell before the invaders, but his son Ardys finally threw off their yoke and resumed the attacks on the Greek cities. This policy was continued by Sadyattes and Alyattes, under whom the conquest of Asia Minor seems to have been completed. The latter's war with the Medes was settled in 585 B.C., by a treaty fixing the river Halys as the eastern boundary of his realm. Lydian government of the Greek cities seems to have been merely nominal, and the Ionians were willing to pay tribute in return for the large advantages in trade. (See IONIA.) This friendly policy was continued by the last King of this race, the famous Crœsus (q.v.), until his overthrow by Cyrus the Great in 546 B.C. The subsequent history of Lydia as a Persian province and as subject to Greeks and Romans is unimportant.

The chief cities of Lydia were Magnesia and Sipylum (see MAGNESIA) and Sardis (q.v.). Excavations made by American scholars in recent times have led to the discovery of a large number of Lydian inscriptions, the study of which may ultimately lead to the understanding of the Lydian language. Consult the article "Archæology," in THE NEW INTERNATIONAL YEAR BOOK (1910–). The YEAR BOOK for 1912 records the discovery of a bilingual inscription, eight lines long, in Aramaic and Lydian; that for 1913 notes the finding of an important bilingual inscription in Lydian and Greek. These and other bilingual inscriptions which, it is to be hoped, will be found later, will prove a key both to the Lydian language and the Lydian civilization. See SARDIS.

The only important remains of native Lydian art are the great tumuli, near the Gygæan Lake, which mark the graves of the kings. The religion was that common in Phrygia and throughout Asia Minor: it included the worship of a great nature goddess, the "mother of the gods"; a nature god, Sabazios, honored by wild orgies; a god of heaven, identified by the Greeks with Zeus; a moon god, Men; and in some places a sun god. The cult was, in general, orgiastic, and the worshipers often mutilated themselves.

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LYDIA LANGUISH. A romantic girl in Sheridan's *Rivals*, sought by Captain Absolute under the disguise of Ensign Beverley.

LYDIAN STONE. See TOUCHSTONE.

LYE (AS. *lēah*, OHG. *louga*, *lauga*, Ger. *Lauge;* connected with Icel. *laug*, warm bath, and ultimately with Lat. *lavare*, *luere*, Gk. *λούειν*, *louein*, to wash). A term formerly applied to the alkaline solution obtained by treating ashes with water, now used in describing an aqueous solution of any caustic or carbonated alkali. See SOAP.

LY'ELL, SIR CHARLES (1797–1875). One of the most eminent contributors to geological science. He was born at Kinnordy, Scotland, the son of Charles Lyell, who attained some distinction as a scientist and student of Dante. He received his early education at Midhurst and entered Exeter College, Oxford, where his interest in science was awakened by attendance upon the lectures of Dr. Buckland. After receiving the degree of M.A. in 1821, he was entered as student at Lincoln's Inn and in due time was called to the bar. While pursuing his professional duties, he was a frequent contributor to scientific journals and took an active part in the meetings of the Geological and Linnean societies of London. The value of his work was confirmed by election to a fellowship in the Royal Society in 1826, as well as by commendatory notices from Cuvier, Humboldt, and other savants of the day. In 1828, for the purpose of broadening his knowledge of science, he accompanied Sir Roderick Murchison on a tour of Europe, in the course of which he collected a large amount of material that was destined to be of great service in his later scientific work. While traveling in Sicily, he remarked the evidences of recent elevation of the island, which strengthened his belief in the theory that great geological changes do not require catastrophic agencies for their accomplishment; and he worked out a stratigraphic division for the Tertiary formation based upon the relative proportion of living to extinct species of mollusks found in the rocks. The first volume of his great work, *Principles of Geology*, appeared in 1830, the second in 1832, and the third in 1833. Its appearance may be said to mark an epoch in geological science. A third edition of the whole work was published in 1834, and other editions were issued in rapid succession. In 1835 Lyell was elected president of the Geological Society of London. He visited the United States in 1841, when he lectured before the Lowell Institute in Boston, and again in 1845–46; the results of his scientific and political studies during his visits to America were embodied in book form. He was knighted in 1848, and later he received a baronetcy. He was elected to membership in many foreign scientific societies and served as president of the British Association for the Advancement of Science. He died in London, Feb. 22, 1875, and was buried in Westminster Abbey.

Lyell has justly been called the founder of modern geology. While not the originator of the doctrine of uniformitarianism (q.v.), he was its stanchest and ablest advocate and was completely successful in securing its universal adoption by geologists. Lyell was also influential in securing recognition for Darwin's theory of evolution, which in a way was but the logical outcome of the *Principles of Geology.* In addition to this great work, which had passed through 12 editions, Lyell contributed over 75 papers to various society journals, and also wrote the following extended works: *Elements of Geology* (1838); *Travels in North America, with Geological Observations* (1845); *A Second Visit to the United States of North America* (1849); *The Antiquity of Man* (1863); *The Student's Elements of Geology* (1871). For an estimate of Lyell's services to science, consult Sir Archibald Geikie, *The Founders of Geology* (2d ed., London, 1906); for an account of his life, consult *Life and Letters of Sir Charles Lyell,* edited by Mrs. Lyell, his sister-in-law (ib., 2 vols., 1881); and also consult the letters to and from Charles Darwin in the volumes of Darwin's correspondence (1903).

LYGINODENDRON, lĭj′ĭ-nȯ-dĕn′dron. A genus of Cycadofilicales, an extinct group of fernlike gymnosperms. This generic name is applied to the stems. Associated with these stems are the characteristic seeds which determined that these supposed ferns were seed plants. This genus represents those Cycadofilicales whose stem structures approach most nearly the modern gymnosperms.

LYGO′DIUM (Neo-Lat., from Gk. λυγώδης, *lygōdēs,* withy-shaped, from λύγος, *lygos,* withy + εἶδος, *eidos,* form). A genus of twining, vinelike ferns, including about 25 species, most of which are tropical. A North American specimen is *Lygodium palmatum* (climbing fern or Hartford fern). It occurs in moist thickets or open woods from New Hampshire to Pennsylvania and south to Florida and Tennessee. It is a very delicate and graceful fern and is much used for ornamental purposes, both fresh and dried. Other species are in cultivation, especially *Lygodium japonicum.* See Colored Plate of Ferns.

LY′KENS. A borough in Dauphin Co., Pa., 30 miles southwest of Pottsville, on the Pennsylvania and the Williams Valley railroads (Map: Pennsylvania, H 6). The borough is engaged principally in hard-coal mining, and there are also hosiery mills, a paper-box factory, a foundry, and tap and reamer works. Pop., 1900, 2762; 1910, 2943.

LYKE′WAKE. See Mortuary Customs.

LYLY, lĭl′ĭ, or **LILLY,** John (c.1554–1606). An English romancer and dramatist, born in Kent about 1554. He graduated at Magdalen College, Oxford, in 1573, became M.A. in 1575, and was incorporated M.A. at Cambridge in 1579; went to London and strove unsuccessfully to win a place at court; secured the patronage of Lord Burghley, who gave him some post in his household; took part in the Martin Marprelate controversy, contributing a tract entitled *Pappe with an Hatchet* (1589); was elected to Parliament in 1589, 1593, 1597, and 1601; and died November, 1606. Lyly became famous on the publication of *Euphues* (part i, 1579; part ii, 1580), which added a new word, *euphuism* (q.v.), to the English language. The style of this romance runs riot in alliteration, antithesis, epigram, and figures and illustrations from mythology and fabulous natural history. Lyly was followed by a large number of writers in this style, known as Euphuists, among whom were Greene and Lodge. Lyly also wrote eight plays which were performed at court by companies of children. They are, in the order of publication, *Alexander and Campaspe* (1584), *Sapho and Phao* (1584), *Endymion* (1591), *Gallathea* (1592), *Midas* (1592), *Mother Bombie* (1594), *The Woman in the Moone* (1597), and *Love's Metamorphosis* (1601). These plays are mostly on mythological themes, and, except *The Woman in the Moone,* are in prose. The plays written by Lyly, Peele, Greene, Lodge, Marlowe, Kyd, Nash, and Shakespeare before 1596 were in prose, in rhyme, or in blank verse mixed with prose and rhyme. Before 1587, when Marlowe in his *Tamburlaine* made blank verse so beautiful and fitting as to overcome other dramatic styles, prose and rhyme had prevailed. By writing much of his eight dramas in prose Lyly established its use, and his example may have had its influence upon Shakespeare's not infrequent mingling of prose with his blank verse. Lyly's charming songs, scattered through his dramas, are the forerunners of the lyrics in Shakespeare and other dramatists. The "quips and cranks," repartees and similes, of Lyly also were models for a like play of contorted dialogue in Shakespeare, who ridiculed this fantastic fashion in speech.

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LYMAN, lī′man, Benjamin Smith (1835–1920). An American mining engineer and geologist, born at Northampton, Mass. He graduated from Harvard in 1855 and afterward studied at the Ecole des Mines in Paris (1859–61) and at the Freiberg (Saxony) Mining Academy (1861–62). In 1870 he surveyed oil fields for the Public Works Department of the government of India, and in 1873–79 was chief geologist and mining engineer to the Japanese government. He was assistant on the Pennsylvania geological survey from 1887 until 1895. His papers include: *General Report on the Punjab Oil Lands* (1878); *Preliminary Report on the First Season's Work of the Geological Survey of Yesso* (1874); *A General Report on the Geology of Yesso* (1877); *Geological Survey of Japan* (1879); *Japanese Swords* (1892); *The Philippines* (1907).

LYMAN, Chester Smith (1814–90). An

American astronomer, born at Manchester, Conn. He graduated at Yale in 1837, and studied at Union Theological Seminary in 1839–42. He was pastor of a Congregational church at New Britain, Conn., in 1843–45. In 1846–47 he visited the Hawaiian Islands and was appointed instructor at the Royal School at Honolulu. In 1847 he proceeded to California and engaged in surveying. He returned to the East in 1850 and took up the study of the mathematical sciences, for which he had evinced a strong aptitude when scarcely 15 years old. In 1858 he became professor of industrial mechanics and physics at Yale, in 1871 was made professor of astronomy and physics, and taught astronomy from 1884 to 1889, when he became professor emeritus. He contributed interesting papers to the *American Journal of Science* and the *New Englander* and was responsible for several valuable inventions, including the combination zenith telescope and transit for latitude, longitude, and time.

LYMAN, Henry (1809–34). An American missionary. He was born at Northampton, Mass., graduated at Andover Theological Seminary in 1832, studied medicine, and in 1833 went with the Rev. Samuel Munson as a missionary of the American Board to the Indian Archipelago. Having visited Batavia, Padang, the Battoo group, and Pulo Nigas, the two missionaries undertook to reach the Battas in the interior of Sumatra. Wars prevailed among the tribes, and at the village of Sacca the missionaries were regarded as enemies and murdered. Mr. Lyman was the author of a book on the *Condition of Females in Pagan Countries* (1832). For his life, consult the memoir by his sister (New York, 1857).

LYMAN, Phineas (1716–74). An American soldier, born at Durham, Conn. He graduated at Yale in 1738, was a tutor there until 1741, studied law and began practice at Suffield, then within the boundaries of Massachusetts. He soon acquired considerable legal reputation and political influence, which was increased in 1749 by his success in advocating the detaching of Suffield from Massachusetts and its annexation to Connecticut. From 1749 to 1755 he was a member of the Upper Chamber of the Connecticut Legislature. In March, 1755, he was appointed a major general and was made commander in chief of the Connecticut militia force of 1000 men, which participated in the unsuccessful expedition against Crown Point (q.v.). He then constructed Fort Edward (q.v.), named at first, after him, Fort Lyman, but renamed by order of Gen. Sir William Johnson (q.v.), the leader of the expedition, who was jealous of Lyman's popularity. At the battle of Lake George (Sept. 8, 1755) Lyman, after Johnson had received a slight wound, took command of the forces and repulsed the attack of the French and Indians. Lyman was for a time in 1757 in command of Fort Edward, and in 1758 commanded the Connecticut forces in the expedition of General Abercrombie which resulted in the disastrous repulse at Ticonderoga. The following year he was with Lord Amherst at the capture of Crown Point and Ticonderoga and in 1760 took part in the expeditions to Oswego and Montreal. In 1762 he commanded the colonial contingent of Lord Albemarle's army in the capture of Havana. In 1763 he went to England, where, owing to political changes which greatly delayed the object of his visit, he remained until 1772, endeavoring to obtain a grant of land in west Florida. In this he was at last successful, a tract near Natchez (now Mississippi) being granted by royal charter. Lyman led a band of settlers to the region in the next year.

LYMAN, Theodore (1792–1849). An American philanthropist, politician, and author, born in Boston. He graduated at Harvard in 1810, visited Europe (1812–14), studied law, and, with Edward Everett, revisited Europe in 1817–19. From 1819 to 1822 he was aid-de-camp to the Governor of Massachusetts and became brigadier general of militia in 1823, from 1820 to 1825 he served in the State Legislature, and from 1834 to 1835 he was mayor of Boston. He was a steadfast opponent of the radical Abolitionists, and in August, 1835, presided over a pro-slavery meeting in Boston; though a few weeks later, during an anti-Abolitionist riot, he rescued William Lloyd Garrison from the mob and confined him in jail to save his life. He was a liberal benefactor of the State Horticultural Society and of the Farm School and was the founder of the Reform School, to which, altogether, he gave $72,000. He published: *Three Weeks in Paris* (1814); *The Political State of Italy* (1820); *Account of the Hartford Convention* (1823), in which he defended those who were concerned in that convention; and *The Diplomacy of the United States with Foreign Nations* (1828), a work which is still valuable for the period covered.

LYMAN, Theodore (1833–97). An American naturalist, son of Theodore Lyman (q.v.). He was born at Waltham, Mass., graduated at Harvard in 1855 and at the Lawrence Scientific School of the University in 1858, and from 1863 to 1865 was aid-de-camp, with rank of lieutenant colonel, on the staff of Gen. G. G. Meade. As Massachusetts fish commissioner (1865–82), he conducted the first experiments made by any State to preserve and develop food fishes. He served from 1883 to 1885 in the House of Representatives as an Independent and a civil-service reformer. His scientific work was largely on the Radiata, his researches having for the most part been made in the Museum of Comparative Zoölogy at Harvard, where he was appointed assistant in 1860, and to which he presented his valuable collection of technical books. He is distinguished for his papers on the Radiata. His publications include an *Illustrated Catalogue of the Ophiuridæ and Astrophytidæ in the Museum of Comparative Zoölogy* (1865); *Old and New Ophiuridæ and Astrophytidæ* (1874); *Report on the Ophiuridæ Dredged by H. M. S. Challenger during the Years 1873–76* (1882).

LYME GRASS (*lyme*, obsolete spelling of *lime + grass*), *Elymus*. A genus of grasses of which there are about 30 species, natives of the temperate and colder regions of the Northern Hemisphere, also called wild rye. In Iceland the seed, which is large, is collected and ground into meal, which is made into porridge or soft thin cakes and is esteemed a great delicacy. Its stems are used in various countries for thatch. A closely allied species or a variety, called giant lyme grass (*Elymus giganteus*), is often sown in Holland, being preferred for its more vigorous growth. Various expedients are adopted to secure the growth of lyme grass in very loose sands, as the laying down of pieces of turf, a gradual advancement from the margin of the sand, etc. The sea lyme grass (*Elymus arena-*

rius, formerly called *Elymus mollis*) is common in parts of Europe, in North America about the Great Lakes, on the Atlantic, and along the Pacific Ocean from Oregon to Alaska. It is useful as a sand-binding grass, as a thatch, and in Alaska it has been very successfully employed as silage for cattle. There are several species indigenous to the Rocky Mountain region that are extensively used for hay. The principal species are *Elymus condensatus* and *Elymus macounii*. They grow in wet meadows and along streams—the first species often attaining a height of 5 to 10 feet, the other from 2 to 4 feet. When used for hay, they must be cut while young. The seeds are used for food by the Indians.

LYME REGIS, lĭm rē′jĭs. A seaport town in Dorsetshire, England, at the mouth of the Lynn, 22 miles west of Dorchester (Map: England, D 6). It is chiefly noted as a summer watering place, affording excellent sea bathing. It owns its water supply and supports technical education. It is mentioned repeatedly in English history from the Domesday Book onward, and the Duke of Monmouth landed here in 1685, when he attempted to dethrone James II. The ichthyosaurus and plesiosaurus were discovered here in the Lias rocks. Pop., 1901, 2100; 1911, 2772. Consult Roberts, *History of Lyme-Regis* (London, 1834).

LYMPH (Lat. *lympha*, OLat. *lumpha*, Oscan *diumpa*, clear water; connected with *limpidus*, clear, Gk. *λάμπειν*, *lampein*, to shine). The term applied by physiologists to the fluid in the lymphatics. (See LYMPHATIC.) It is a colorless or faintly yellowish-red fluid, of a rather saltish taste, and with an alkaline reaction. It coagulates shortly after its removal from the living body and forms a jelly-like, semisolid mass, which continues for some time to contract, so that at last the clot is very small, in proportion to the expressed serum. On microscopic examination the lymph is seen to contain corpuscles which do not in any respect differ from the colorless blood cells, molecular granules, fat globules, and occasionally blood corpuscles. The chemical constituents of lymph seem to be precisely the same as those of blood, excepting the substance peculiar to the red corpuscles.

The lymph seems to owe its origin to two distinct sources, viz., to the ultimate radicles of the lymphatic system, which contribute the homogeneous fluid portion, and the lymphatic glands, which contribute the corpuscles, granules, etc., seen under the microscope.

The lymphatics convey the lymph into the *receptaculum chyli*, a long pouch which lies along the spinal column, or into the thoracic duct, which is a prolongation of the pouch and finally empties into the left subclavian vein. The lymphatics of the intestine carry chyle, during the process of digestion, which they empty into the receptaculum. They are known as lacteals. From experiments on animals, it has been inferred that upward of 28 pounds of lymph and chyle pass daily into the blood of an adult man. The uses of the fluid are twofold: in the first place, to convey from the tissues to the blood effete matters, to be afterward excreted by the skin, lungs, and kidneys; and, secondly, to supply new materials for the formation of blood.

The term "lymph" has been applied to the fluid taken from the vaccinia vesicle and employed in vaccination (q.v.). It has also been applied to serums prepared from cultures of bacteria and used in inoculating for the prevention or treatment of various germ diseases. (See ANTITOXIN; SERUM THERAPY.) The name was also given in 1890 to the preparation made by Robert Koch (q.v.) from cultures of the tubercle bacilli and used as a test for the presence of tuberculosis. This preparation was called Koch's lymph, or tuberculin (q.v.). See also TUBERCULOSIS.

Beginning about 1899, a substance called goat lymph came into vogue among the ignorant and credulous, to which was ascribed marvelous recuperative powers. It was claimed to be a cure for the debility of age. This "lymph" is a fluid obtained by macerating goats' testicles in fluid and is a copy of the old and discredited Brown-Séquard's elixir. (See BROWN-SÉQUARD.) In such a fluid there exist certain ptomaines, which cause a temporary stimulation when injected into the body and taken up by the circulation. See LYMPHATIC.

LYMPH, KOCH'S. See TUBERCULIN.

LYMPHADENI′TIS. See ADENITIS.

LYMPHADENO′MA. See HODGKIN'S DISEASE.

LYMPHAT′IC. A vessel containing lymph (q.v.), also called an *absorbent*, from the property which it possesses of absorbing foreign matters into the system and carrying them into the circulation. The lymphatic system includes not only the lymphatic vessels and the glands through which they pass, but also the lacteals (see LACTEAL), which are nothing more than the lymphatics of the small intestine, and only differ from other lymphatics in conveying chyle (q.v.) instead of lymph during the latter part of the digestive process.

The lymphatics are minute, delicate, and transparent vessels, of tolerable uniformity in size, and remarkable for their knotted appearance, which is due to the presence of numerous valves, for their frequent dichotomous divisions, and for their division into several branches before entering a gland. They collect the products of digestion and the products of worn-out tissues and convey them into the venous circulation near the heart. They are found in nearly every texture and organ of the body, excepting the substance of the brain and spinal cord, the eyeball, cartilage, tendon, and certain fœtal strictures, and possibly also the substance of bone.

The lymphatics are arranged in a superficial and a deep set. The superficial vessels on the surface of the body lie immediately beneath the skin and join the deep lymphatics in certain points through perforations of the deep fascia; while in the interior of the body they lie in the submucous and subserous areolar tissue. They arise in the form of a network, from which they pass to lymphatic glands or to a larger trunk. The deep lymphatics are larger than the superficial, and accompany the deep blood vessels; their mode of origin is not known with certainty. The structure of the lymphatics is similar to that of veins and arteries, more nearly resembling the former.

The lymphatic or absorbent glands are small, solid, glandular bodies, varying from the size of a hempseed to that of an almond, and situated in the course of the lymphatic vessels. They are found in the neck (where they often become enlarged and inflamed, especially in scrofulous subjects), in the axilla, or armpit, in the groin (where, when inflamed, they give rise to the condition known as *bubo*), and in the thigh;

while deep ones are found abundantly in the abdomen and the chest.

The lymph of the left side of the trunk, of both legs, of the left arm, and the whole of the chyle is conveyed into the blood by the thoracic duct, while the lymph of the right side of the head, neck, and trunk, and of the right arm enters the circulation at the junction of the axillary and internal jugular veins on the right side, by a short trunk, guarded at its opening by valves.

Among the affections to which the lymphatic system is subject may be mentioned lymphangitis, or inflammation of the lymphatic vessels. It is generally due to septic wounds, in themselves often very slight. The inflammation travels along the lymph channels, giving rise to pain and tenderness and severe constitutional symptoms, beginning with a chill or rigor and followed by a high temperature, vomiting, and diarrhœa. If the glands are involved, the condition is known as lymphangitis. Lymphatic fistula, or lymphorrhea, is a rare condition, due to wounding a lymphatic vessel. Lymphatic varix, or lymphangiectasis, is another rare affection, consisting of great dilatation of the lymphatic channels and associated with a form of elephantiasis (q.v.).

Other affections involving the lymphatic system are inflammation of the lymph glands in scrofula; swelling of the lymph glands in pulmonary cancer, in tuberculosis, and in inflammation of the mouth and tongue; tumors involving the lymph glands; lymphosarcoma; leucocythæmia; etc.

LYM′PHATISM. A condition chiefly observed in children and characterized by hyperplasia of the spleen, the thymus, and the lymphatic glands and tissues, including the bone marrow. The tonsils and thyroid glands are also likely to be enlarged. In such subjects there is a marked tendency to sudden death, without apparent cause, or during general anæsthesia, and a special sensibility towards antitoxin. See STATUS LYMPHATICUS.

LYNAKER, T. See LINACRE, T.

LYN′CEUS. 1. In Greek mythology, a son of Aphareus, famed for his powers of sight. He was a participant in the Calydonian Hunt and the Argonautic Expedition and was slain by Pollux. (See ARGONAUTS; CALYDONIAN BOAR.) 2. The husband of Hypermnestra (q.v.) and the only one of the 50 sons of Ægyptus whose life was spared by his wife. See DANAUS.

LYNCH, CHARLES (1736–96). An American pioneer, politician, and soldier. He was born at Chestnut Hill, Va. At 19 he became one of the pioneers of Bedford County. In 1767 he was elected to the House of Burgesses, and it was largely due to his influence that Virginia sent to her delegates in Congress the instructions which led to the Declaration of Independence. In 1774 he was elected justice of the peace and in 1778 was appointed colonel of militia. It was in both these characters that he acted when, in 1780, just as he was about to lead his cavalry regiment to assist in repelling the British invasion, a formidable conspiracy was discovered among the Tories of Bedford County. He employed his troops to secure the ringleaders, and then, as justice of the peace, condemned them to terms of imprisonment, as that was the only way of keeping them out of mischief during the absence of the local military. In taking this action, however, he clearly exceeded the limit of his powers, and when, after the fall of Yorktown, he returned, the Tories threatened to prosecute him. Lynch appealed to the Legislature, and that body passed an act admitting the illegality of his action, but, in consideration of the circumstances, exonerating him. See LYNCH LAW.

LYNCH, FREDERICK (HENRY) (1867–). An American Congregational clergyman and editor, born at Peace Dale, R. I. He was educated at Yale University (A.B., 1894; B.D., 1897) and was ordained to the Congregational ministry in 1899. He served as assistant pastor at New Haven, Conn. (1896–98), and as pastor at Lenox, Mass. (1898–1904), and of the Pilgrim Church, New York City (1904–10). In 1908 he became editor of *Christian Work and Evangelist.* He was one of the founders of the Peace Arbitration Society of New York, became director of the New York Peace Society and secretary of the Church Peace League of America, and attended peace congresses at Munich in 1897 and at London in 1908. In 1915 he sought to bring together leading representatives of the Catholic church and of the various Protestant denominations in an effort to check growing antagonism. His writings include: *The Enlargement of Life* (1903); *Is Life Worth Living?* (1905); *The Gospel for Today* (1905); *The Peace Problem* (1911); *New Opportunities of the Ministry* (1912); *What Makes a Nation Great?* (1913; 2d ed., 1914).

LYNCH, HENRY FINNIS BLOSSE (1862–1913). An English traveler. He was born in London and was educated at the University of Heidelberg and at Trinity College, Cambridge. In 1888 he traveled from Alexandretta through the Aleppo and Diarbekir on horseback and then down the Tigris River on a raft to Bagdad, and subsequently inaugurated a new river service on Karun River, Persia, under the British flag. He made surveys for a new trade route in Persia, afterward known as the "Lynch Road." In 1893 he traveled in the Caucasus and in Armenia and again in 1898 made extensive travels and surveys in Armenia. From 1906 to 1910 he was a Liberal member of Parliament, and as such strongly criticized the British foreign policy in Persia. He wrote *Armenia: Travels and Studies* (2 vols., 1901; Russ. ed., 1910) and many special articles on the Middle East.

LYNCH, JAMES MATHEW (1867–). An American union labor leader and public official. He was born and educated at Manlius, N. Y. In 1881 he set out to learn the printing trade; later he became active in union labor politics, and for seven terms he was president of the Syracuse (N. Y.) Trade Assembly. He served as first vice president (1899–1900) and as president (1900–14) of the International Typographical Union and became a member of the National Civic Federation. In 1913 Lynch was appointed public printer of the United States. He was also labor commissioner of New York State (1913–15) and then a member of the new Industrial Commission.

LYNCH, JOHN JOSEPH (1816–88). A Canadian Roman Catholic archbishop, born in Ireland. He was educated in Dublin and Paris and in 1843 was ordained a priest. After being a professor for three years in the College of Castleknock, he came to the United States and began missionary work at Houston, Tex. Afterward he went to Missouri and became president of the Lazarist College of St. Mary the Barren in that

State. He afterward went to Canada, founded the Seminary of Our Lady of Angels, near Niagara Falls, and in 1860 was appointed Bishop of Toronto. He attended the Vatican Council in 1869 and was made Archbishop of Toronto and Metropolitan of Ontario.

LYNCH, Patricio (1825–86). A Chilean naval officer, of Irish descent, born in Valparaiso. He was educated for the navy and saw active service in the war with Peru in 1838. The following year he entered the English navy and took part in the Chinese War (1840–42). Returning to Chile, he reëntered the navy in 1847 as a lieutenant. In 1865 he fought in the war against Spain and was made Governor of Valparaiso. He was in command of an expedition in 1879 and 1880 that destroyed an enormous amount of property in the northern part of Peru and during the campaign that followed took part in the battle of Chorrillos, the attack on Lima, and the battle of Miraflores. As a reward for his services, he was made rear admiral and commander of the Chilean army. He kept strict military discipline in the captured city of Lima, deposed the Calderón government, and took Calderón himself prisoner despite the objections of the United States Minister. After peace was proclaimed he was promoted to be vice admiral of the Chilean navy and Minister to Spain (1885). He died at sea on his return voyage to Chile.

LYNCH, Thomas, Jr. (1749–79). An American patriot, one of the signers of the Declaration of Independence, born in South Carolina. At the age of 14 he went to England, where he was educated at Eton and Cambridge, and was admitted to the practice of law in the Inns of Court, London, in 1767. In 1772 he returned to South Carolina and became active in the Patriot cause. He was appointed captain of one of the provincial regiments in 1775; in 1776 he succeeded his father (c.1720–76) in Philadelphia as one of the South Carolina delegates in the Continental Congress.

LYNCH, William Francis (1801–65). An American naval officer, born in Norfolk, Va. In 1848 he conducted a valuable official survey of the Jordan River and the Dead Sea. He became commander in 1849 and captain in 1856, resigning in 1861 to enter the Confederate service, in which he attained the rank of commodore. He published *Narrative of the United States Expedition to the River Jordan and the Dead Sea* (1849) and *Naval Life, or Observations Afloat and on Shore* (1850).

LYNCH′BURG. A city in Virginia, 147 miles by rail west by south of Richmond, on the James River, and on the Norfolk and Western, the Southern, and the Chesapeake and Ohio railroads (Map: Virginia, E 4). The situation of the city is remarkably picturesque. A steep acclivity rises from the banks of the river, breaking into numerous hills, whose terraced walls, ornamented with trees and skirting handsome dwellings, present an attractive appearance. In the background, at a distance of 20 miles but prominently in view, rise the Blue Ridge Hills and the Peaks of Otter. There are about 90 acres in public parks. The city is the seat of the Randolph Macon Woman's College, the Virginia Christian College, the Virginia Seminary (colored), and has the Miller Female Orphan Asylum, the Presbyterian Orphanage, the State Odd Fellows' Orphans' Home, the Jones Memorial Library, a fine high-school building, and three well-equipped hospitals. The largest single industry of Lynchburg is the manufacture of shoes. It is also the centre of large tobacco manufactures and, on account of its excellent railroad facilities, controls important jobbing and shipping interests. Vast fields of coal, iron ore, and quarries of granite are in the neighborhood. There are iron and brass foundries, flour mills, cotton mills, shoe factories, pipe works, dye works, and manufactories of bark extract, hardware, candy, hosiery, mattresses, boxes, cigarette machines, medicines, bricks, leather novelties, plows, wagons, textiles, etc. By means of two dams in the James River the city is afforded excellent water power. The government, under the new State constitution, is vested in a mayor, elected every four years, and a bicameral council in which rests appointment to the majority of administrative offices. The clerk of courts and city treasurer are, however, elected by the people. The chief duty of the mayor is to preside over the police court. Lynchburg owns and operates the water works. Pop., 1900, 18,891; 1910, 29,494; 1914, 31,830; 1920, 29,956.

Founded in 1786 by John Lynch, Lynchburg was first incorporated in 1823. During the Civil War it was used by the Confederates as a base of supplies, and on June 18, 1864, the Federal General Hunter made an unsuccessful attempt to capture it. Consult J. M. Cabell, *Sketches and Recollections of Lynchburg* (Richmond, Va., 1858), and W. A. Christian, *History of Lynchburg* (ib., 1900).

LYNCH LAW. In the United States, a term applied to the summary method of inflicting punishment for certain offenses by mob violence and without warrant of law. Formerly the term was applied to any unauthorized punishment so inflicted, but now it is restricted mainly to the infliction of the death penalty. The origin of the term is involved in obscurity. The most generally accepted explanation associates the beginning of the practice with one Charles Lynch (q.v.), a Virginia planter, who undertook to maintain order by taking into his own hands the punishment of all disorderly or disaffected persons. This method of dealing with the lawless element met the approval of a lawless community and was much practiced after the Revolution with the result, it is said, that many suits were before the courts in 1792 for inflicting lynch law in the region south of the James River. In England lynch law was early practiced under the name of Lydford law; in Scotland, under the appellation of Cowper law. Except in the early settlement of California before civil government had been established, the practice of lynching in the United States was seldom resorted to until after the Civil War. In the disorders incident to the emancipation of the slaves and the enforcement of the reconstruction acts, however, bands of white men under the name of the Ku-Klux Klan (q.v.) frequently resorted to lynch law to get rid of objectionable colored men. The demoralization and disregard of the law which the influences of the time created in the minds of the white race did not disappear with the restoration of white supremacy in the South. With the increasing amount of crime among the black race went an increase in the number of lynchings. Presently it became an unwritten law that no colored offender charged with a criminal assault upon a white woman should be allowed the privilege of trial before a court of law. But lynching is not now restricted to the offense of rape, as the statistics quoted below will show. Moreover, it is not wholly confined to any particular section of the country, although more general in the South than in other parts of the country. It is also resorted to more frequently in the newly settled West than in the older North and East. It is only within the last few years that any trustworthy record of the number and distribution of lynchings has been made. However, such statistics as are available indicate that nearly 3500 persons have been done to death by this deliberate form of mob violence in the last 30 years (1885–1915) in the United States. According to statistics given by Dr. Cutler in his book, *Lynch Law*, 3337 persons were lynched in the United States in the period from 1882 to 1903. The greatest number in any one year was 235 in 1892. From that year there was a steady decline in the number, the lowest point reached being 97 in 1902. According to the Chicago *Tribune* record of lynchings, the number for 1903 was only 66.

Of the 3337 persons lynched during this period, 2060 were negroes. Of the remaining 1277 (whites, Indians, etc.), 49.2 per cent were charged with murder, 20.6 per cent with theft, 8.5 per cent with rape. Of the negroes lynched, 38 per cent were charged with murder, 34.3 per cent with rape, 5 per cent with arson, 4.9 per cent with theft. A majority of all lynchings occurred in the Southern States (2585), a greater number (334) occurring in Mississippi than in any other State. During this period only one lynching took place in New England. In the nine months from Jan. 1 to Oct. 1, 1914, 27 lynchings are recorded, of which 25 occurred in the South and two in the North. Of the victims, 22 were negroes and 5 whites; 24 were males and 3 females. The offenses of which they were suspected were: murder 19, rape 3, murderous assault 2, theft 1, and unascertained 2. The largest number in any one State was 7, in Louisiana. Under the Constitution the national government has little or no power to check the barbarous practice of lynching. The administration of the criminal law, except in a few cases, is left to the individual States, and the punishment of those who are guilty of taking part in the business of lynching is the duty of the States. Nevertheless, whenever the subject of a foreign government is lynched by an American mob, the United States is held responsible and has on several occasions been called upon to pay an indemnity to the families of victims of lynch law. This happened twice in the case of several Chinese subjects who were lynched by mobs in Wyoming and California, and twice in the case of Italians lynched in Louisiana and California. The total amount of the indemnity paid in these cases exceeded $250,000. Recently there has been a marked increase in the activity of the State governments in several quarters with a view to checking the growth of mob law. Several of the present executives of States where the practice of lynching is most frequent have made earnest appeals to the legislatures of their respective Commonwealths to enact extraordinary measures to meet the situation, and they have, in a number of cases, foiled the attempts of lynching mobs by prompt use of the militia. Several States, notably Ohio and South Carolina, have enacted laws making the county in which a lynching occurs responsible in pecuniary damages to the family or heirs of the person lynched, while in several States laws have been passed which provide for the suspension from office of sheriffs who fail to protect citizens of their respective counties from the violence of mob law. These measures have not proved to be adequate. The remedy most generally advocated for the suppression of lynch law is the just, prompt, and efficient activity of the courts in bringing to speedy justice persons guilty of the offenses for which lynching is usually resorted to. But public sentiment in those parts where lynchings are most frequent is too strong against publicity of trial where the honor of a woman is involved to allow the courts to inflict the punishment which the offender is believed to deserve. Moreover, the recent action of mobs in several instances in lynching criminals who had been duly convicted by the courts and sentenced to death shows that the remedy suggested will scarcely be effective. The conviction and punishment of persons guilty of taking part in lynchings are of the rarest occurrence, owing to the sympathy of the juries with the guilty parties. Consult: Albert Matthews, *The Term Lynch Law* (Chicago, 1904); J. E. Cutler, *Lynch Law* (New York, 1905); A. B. Hart, *The Southern South* (ib., 1910); Channing and Hart, *Guide to the Study of American History* (Boston, 1912); McLaughlin and Hart, *Cyclopedia of American Government*, vol. ii (New York, 1914).

LYNCO'RIUM. See GEMS.

LYNDE, lĭnd, FRANCIS (1856–). An American novelist, born in Lewiston, N. Y. In the railroad service up to 1893, he devoted himself thereafter to literary work. His books include: *A Romance in Transit* (1898); *The Helpers* (1899); *The Grafters* (1904); *The Quickening* (1906); *Empire Builders* (1907); *The Taming of Red Butte Western* (1910); *The Price* (1911); *The Honorable Senator Sage-Brush* (1913); *The City of Numbered Days* (1914).

LYNDHURST, lĭnd'hẽrst, LORD. A British lawyer and statesman. See COPLEY, JOHN SINGLETON.

LYN'DON. A town in Caledonia Co., Vt., 8 miles north of St. Johnsbury (Map: Vermont, E 3). It is the seat of the Lyndon School of Agriculture and the Lyndon Institute and contains a public library, railroad shops of the Boston and Maine system, a brass foundry, creamery, etc. There are municipal water works and an electric-light plant. Pop., 1900, 2956; 1910, 3204.

LYNDSAY, lĭn'zĭ, SIR DAVID. A Scottish poet. See LINDSAY.

LYNEDOCH, lĭn'dŏk, THOMAS GRAHAM, first BARON (1748–1843). A British general, the son of Thomas Graeme, laird of Balgowan, Perthshire. He was trained by private tutors, preparatory to a brief course at Christ Church, Oxford. In 1793 he volunteered in the army. He was elected to Parliament from Perthshire the same year and retained his seat until 1807. He completed the siege of Valetta in 1800, served under Sir John Moore in Portugal in 1808–09, and in 1811 gained the brilliant victory of Barossa over the French. He took part in the siege of Ciudad Rodrigo (1812), in 1813 fought at Vittoria and Tolosa, was unsuccessful in his assault on St. Sebastian, and commanded the British force which settled in October on French territory. In 1814 he was again fighting at Merxem and Bergen-op-Zoom and was made Baron with an annual pension of £2000, which he declined. Consult Graham's biography (2d ed., Edinburgh, 1877), and that by A. M. Delavoge

(London, 1880); also A. I. Shand, *Wellington's Lieutenants* (ib., 1902).

LYNN, lĭn. An important manufacturing city in Essex Co., Mass., 11 miles by rail northeast of Boston, on Massachusetts Bay, and on the Boston and Maine and the Boston, Revere Beach, and Lynn (narrow-gauge) railroads (Map: Massachusetts, F 3). The city, 11½ square miles in extent, is near several seaside resorts. It has a shore line of about 3 miles and a safe though shallow harbor. Among the city's features are the fine city hall, two hospitals, a large public library, a Soldiers' Monument, two high schools, Floating Bridge, Forest Park, Lynn Woods, and a fine ocean boulevard. Lynn is noted for its manufacturing interests, particularly of boots and shoes—an industry which dates from 1750 and in which Lynn now leads the world. In 1909 the value of the products of this industry was $46,660,000, which represented an investment of $17,488,000 and gave employment to 17,942 persons. Other extensive manufactures are morocco and leather, shoe manufacturers' supplies, electrical appliances, machinery, foundry and machine-shop products, boxes and patent medicines, the total value of the city's products in 1909 being $71,503,000.

In 1912–13 Lynn spent in maintenance and operation $1,283,038, the principal items of expenditure being $386,000 for schools, $63,000 for charitable institutions, $137,000 for the fire department, $112,000 for the police department, $185,000 for the water works, and $104,000 for sanitation. The city's receipts amounted to $4,533,000. Lynn owns and operates its water-supply system, which has been under construction since 1870 and now comprises 138 miles of mains. The commission form of government was adopted by the city in 1910. Pop., 1800, 2837; 1850, 14,257; 1880, 38,274; 1900, 68,513; 1910, 89,336; 1914 (U. S. est.), 98,207; 1920, 99,148. Settled in 1629, Lynn was known as Saugus until 1637, when its present name was adopted from King's Lynn, England, the home of the second pastor, Samuel Whiting. In 1850 Lynn was organized as a city. Consult F. H. Newhall, *History of Lynn, Massachusetts* (Lynn, 1883), and H. K. Sanderson, *Lynn in the Revolution* (2 vols., Boston, 1909).

LYNN REGIS. See King's Lynn.

LYNX (Lat. *lynx*, from Gk. λύγξ, lynx; connected with Lith. *luszis*, AS. *lox*, OHG. *luhs*, Ger. *Luchs*, lynx, and probably with Lat. *lucere*, to shine, Gk. *λεύσσειν, leussein*, to see, Skt. *ruc*, to shine, OChurch Slav. *lucha*, beam of light, OIr. *lōche*, lightning, OHG. *lioht*, Ger. *Licht*, AS. *lēoht*, Eng. *light*). A kind of wild cat, of which those in North America are examples. It differs from the ordinary small cats of the wilderness by having a less elongated, more robust form, with the haunches elevated and all the limbs massive, the tail very short, the fur generally long, in old males forming almost a ruff about the face, and the ears tipped with tufts or pencils of hair. Naturalists now separate these animals from the genus *Felis* as a genus *Lynx*. In the Old World the lynx (*Lynx lynx*) was once a general inhabitant of the Arctogæan region, but to-day it is never seen south of the Baltic, except in Spain, where it is represented by a highly spotted form, the pardine lynx (*Lynx pardellus*), which Miller (*Catalogue Mammals Western Europe*, London, 1912) treats as a distinct species. The lynx may be found throughout all Asia north of the Himalayas, varying much in its colors, according as it dwells in the Siberian forests or on the dry plains or amid the Himalayan or Tibetan heights. The caracal (q.v.) is a near relative. Its food and habits vary with its habitat, but it is everywhere the strongest and most savage cat of its size and often kills goats and sheep as well as the smaller prey more usual to it.

In North America the lynx (*Lynx canadensis*) originally inhabited every part of the continent north of an indefinite point in Mexico or Central America. It has been traditional to regard the American lynxes as forming two species—the Northern red, or Canada lynx, lucivee (i.e., loup cervier), or catamount, and the southern or bay lynx or bobcat. Both of these are highly variable in size, coloration, and proportion of parts, and no less than three species and 11 subspecies are distinguished and named in Elliot's *Synopsis of Mammals* (Chicago, 1901). The length varies from about 40 inches down to 30 inches, from nose to root of tail. The largest specimens come from the northern forests, while the smallest are those dwelling in the dry, open country of the interior and the Far Southwest; but, in accordance with Allen's law, the latter have the limbs and tail longer in proportion to the size of the animal. The color of the Northern lynx is grizzly brownish gray, the ear tufts and end of the tail black, and the belly white; those of Newfoundland (subspecies *subsolanus*) are darker, and of Alaska (subspecies *mollipilosus*) browner, than the average. Towards the south there appears an increasing tendency to reddishness, which is much brighter in the summer than in the winter coat; and the fur is marked with spottings and lines about the head, which are scant and obscure in the Northern specimens, but very pronounced in those from the Southwest. The pelts find a good sale among furriers.

The habits of lynxes are those of the forest cats generally, and their depredations upon the farmer's poultry, together with the fear inspired by their screams at night and the value of their pelts, have led to their extermination in the more thickly settled States, except in mountain ranges or large tracts of forest or swamp. They are persistent mousers, however, and probably more than repay their occasional thefts by destroying great numbers of injurious rodents. Chiefly nocturnal in their movements, they sleep by day in hollow trees and caverns, and in such places, on a bed of leaves and grass, they bring forth and conceal their kittens, which the mother will defend with a ferocity and skill in fence few animals can withstand. Keen, agile, patient, muscular, and resourceful, the lynx is the terror of the woods in summer and fares well; but how it is able to endure the lifeless cold of the Northern forests in winter is one of the wonders of nature.

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LYOMERI, lī-ŏm′ē-rī (Neo-Lat. nom. pl., from Gk. *λύειν*, *lyein*, to loose + *μέρος*, *meros*, part). An order of eel-shaped fishes, the "gulpers" of low organization, allied to the morays, which inhabit the deep sea, and are characterized by looseness and probably degradation of structure. Their jaws are hinged to the cranium by so elastic ligaments, and all the bones of the head and shoulder girdle are so loose and expansible, that objects may be swallowed larger than the fish itself. Two families are recognized, the Saccopharyngidæ and Eurypharyngidæ, each represented in American waters by a single species.

LY′ON, DAVID GORDON (1852–). An American Assyriologist, born at Benton, Ala., and educated at William Jewell College in Missouri, at Howard College, Alabama (A.B., 1875), and at the University of Leipzig (Ph.D., 1882). He was Hollis professor of divinity at Harvard from 1882 to 1910, and thereafter was Hancock professor of Hebrew and other Oriental languages. He served also as director of the American School for Oriental Study and Research in Palestine in 1906–07, and was president of the Society of Biblical Literature in 1910. One of the first Americans to make a special study of Assyriology, he did much valuable pioneer work in this field. His publications include: *Keilschrifttexte Sargons Königs von Assyrien* (1883); *An Assyrian Manual for the Use of Beginners* (1886, 1892); and many contributions to scientific journals.

LYON, GEORGE FRANCIS (1795–1832). An English navy officer and traveler. He was born at Chichester, entered the navy at 13, joined the squadron of Lord Exmouth which bombarded Algiers in 1816, and in 1818 accompanied Joseph Ritchie, the traveler, on his expedition to north Africa. After many privations and perils in exploring the Sudan and the Niger, he returned to England in 1820, and in 1821, in command of the Hecla, accompanied Captain Parry on his voyage of discovery to Hudson Bay. In 1824 he made an unsuccessful voyage with the *Griper* to the Arctic regions, and in 1826 he traveled in Mexico. He published *A Narrative of Travels in North Africa* (1821) and *Journal of a Residence and Tour in the Republic of Mexico* (1829).

LYON, JOHN (c.1514–92). An English yeoman, the founder of Harrow School (q.v.). He was born at Preston, Middlesex. Possessing ample means, he interested himself in the education of the poor. In 1572 Queen Elizabeth granted him a charter for a free grammar school for boys at Harrow, which was formally opened in 1611. Consult P. M. Thornton, "John Lyon," in *Harrow School*, edited by Howson and Warner (London, 1898), and J. F. Williams, *Harrow* (ib., 1901).

LYON, MARY (1797–1849). An American educator, the founder of Mount Holyoke College and a leader in the movement for the higher education of women. She was born near Buckland, Franklin Co., Mass., and began teaching at 17. Later she attended Sanderson Academy at Ashfield, Amherst Academy, and, notably, the Rev. Joseph Emerson's Female Seminary at Byfield, Mass. In this school, a pioneer in its way, she found a curriculum considered by many too intellectual and strenuous for "young ladies." When one of her fellow pupils, Miss Zilpah P. Grant, became principal of a seminary at Ipswich in 1828, she chose Mary Lyon as her associate. With Miss Grant's aid Miss Lyon undertook to establish another school herself. She settled on the idea of an institution which should offer a thorough education on terms available to young women of moderate means. Previously any sort of "seminary" training had been carefully reserved for the daughters of very well-to-do parents. To cultivate habits of home industry, inspire a spirit of independence, and at the same time eliminate the expense of many servants, Miss Lyon proposed that the domestic tasks of the seminary household should be divided among the girls; that each should do a daily share, without sacrifice either of studies or of recreation. "The idea was not to earn money but to lessen outlay; not to defray but to diminish expenses." Neither the novelty nor the obvious reasonableness of this plan gained it a wide hearing at once. But after three years of work by Miss Lyon and others sufficient support had been assured to justify the experiment. South Hadley, Mass., looking across the Connecticut valley to the Mount Holyoke and Mount Tom ranges, was chosen as the site of the new school. In 1837, when buildings to house 80 pupils were nearly finished, "Mount Holyoke Seminary" opened with an attendance greater than the capacity. During the last 12 years of Miss Lyon's life, which she devoted to this school, its attendance increased to 300. Later, as Mount Holyoke College (q.v.), it took rank as one of the leading women's colleges of the country. Miss Lyon is buried on the campus at South Hadley. She wrote an account of the seminary and a book called *The Missionary Offering*. Consult her life by Edward Hitchcock (New York, 1860); M. O. Nutting, *Historical Sketch of Mount Holyoke Seminary* (Washington, 1876); B. B. Gilchrist, *The Life of Mary Lyon* (Boston, 1910); Adams and Foster, *Heroines of Modern Progress* (New York, 1913).

LYON, MATTHEW (1746–1822). An American soldier and politician. He was born in County Wicklow, Ireland, and emigrated to New York in 1759. Unable to pay his passage, he was committed by the captain to a farmer in Connecticut, with whom he served several years. He subsequently removed to Vermont; became lieutenant in a company of "Green Mountain Boys" in 1775, and was cashiered the latter part of the year for deserting his post. In 1777 he was temporary paymaster of the Northern army and colonel of militia. He founded the town of Fairhaven, Vt., in 1783; built saw mills and gristmills, established a forge, and established and edited a paper called *The Scourge of Aristocracy and Repository of Important Political Truth*, making the types and paper himself. For 10 years he was a member of the Vermont Legislature and in 1786 was judge of the Rutland County court. He became a zealous politician and represented the Anti-Federalists in Congress from 1797 to 1801. In 1798 he was convicted of libel against President Adams and was imprisoned for four months and fined $1000. While in Congress he had a violent personal encounter with Roswell Griswold of Connecticut. After the expiration of his term he removed in 1801 to Kentucky and established the first printing office in the State. From 1803 to 1811 he again sat in Congress, where his habitual employment of invective again made trouble for him; built gunboats on speculation for the War of 1812, and became bankrupt. In 1820 he was appointed by President Monroe United States factor of the Cherokee Indians in Arkansas. Consult: McLaughlin, *Matthew Lyon, the Hampden of Congress: A Biography* (New York, 1900); J. S. Bassett, *The Federalist System* (ib., 1906); Edward Channing, *The Jeffersonian System* (ib., 1906).

LYON, NATHANIEL (1818–61). An American soldier, prominent in the contest between the Unionists and Secessionists in Missouri immediately preceding and in the early part of the Civil War. He was born in Ashford, Conn., graduated at West Point in 1841, served as second lieutenant in the Florida War in 1841–42, and in the Mexican War in 1846–47, participating during the latter in all the important battles of the Southern campaign and receiving the brevet rank of captain. From 1848 to 1861 he was on frontier duty at various posts. He became a captain in 1851, and on Feb. 7, 1861, was placed in command of the United States arsenal in St. Louis, Mo., where he immediately associated himself with Francis P. Blair, Jr., and other ardent Unionists, for the purpose of balking the schemes of the Secessionists and of preventing the withdrawal of Missouri from the Union. He organized and drilled recruits, took energetic measures to hold the arsenal against threatened attacks, and on April 21, General Harney being temporarily removed, assumed command of the Department of the West. On May 10 he surprised and captured a force of Secessionists at Camp Jackson in St. Louis, on May 17 was promoted to be brigadier general of volunteers, and on May 31, by the President's appointment, again supplanted Harney as commander of the department. Finally breaking off all friendly relations with Governor Jackson, the leader of the disloyal element in Missouri, he sent troops to the southwestern part of the State to ward off or meet a threatened Confederate attack from Arkansas and intercept the retreating Missouri Secessionists, and himself advanced at the head of a Federal force against the capital, Jefferson City, which he occupied on June 15. He defeated a Confederate force under General Marmaduke at Boonville on the 17th, and on August 10 attacked a greatly superior body of Confederates under General Price at Wilson's Creek, where, after fighting desperately for some time, he was instantly killed while leading a charge. (See WILSON'S CREEK, BATTLE OF.) His entire fortune, $30,000, was bequeathed to the Federal government for use in prosecuting the war. A series of able letters, dealing with the political situation in 1860, was published with a memoir soon after his death, under the title, *The Last Political Writings of Gen. Nathaniel Lyon* (1862).

Bibliography. Woodward, *Life of General Nathaniel Lyon* (Hartford, 1862); Peckham, *Gen. Nathaniel Lyon and Missouri in 1861* (New York, 1866); T. L. Snead, *The Fight for Missouri* (ib., 1888); Lucien Carr, *Missouri: A Bone of Contention* (ib., 1888); J. F. Rhodes, *History of the United States from the Compromise of 1850*, vol. iii (ib., 1907); J. K. Hosmer, *The Appeal to Arms* (ib., 1907).

LYON, THEODATUS TIMOTHY (1813–1900). A noted American pomologist. He was born at Lima, N. Y., but with his parents in 1828 removed to Michigan. While living at Plymouth, Mich., in 1844 he started a nursery and made a study of fruits, particularly with respect to identification of varieties. The results, which were published in the *Michigan Farmer,* led to correspondence with Charles Downing, who acknowledges his assistance in the revision of *Fruits and Fruit Trees of North America.* He wrote a *History of Michigan Horticulture,* which appeared in the seventeenth report (1888) of the Michigan Horticultural Society, of which he became president in 1876 and honorary president in 1891, a position he held until his death. The Michigan Agricultural College Experiment Station placed him in 1889 in charge of its fruit investigations at South Haven, where he was engaged until his death.

LYON COURT (obsolete spelling of *lion;* so called from the lion on the royal shield). An inferior court of Scotland, having jurisdiction in questions regarding coat armor and precedency, and also in certain matters connected with the execution of the law. It is presided over by the Lyon King-at-Arms or Lord Lyon. Attached to the Lyon Court are a certain number of heralds (see HERALD) and pursuivants (see PURSUIVANT) appointed by him, whose principal duty is now the execution of royal proclamations in Edinburgh, though the heralds were, in old times, to some extent associated with the Lord Lyon in the exercise of his jurisdiction.

The register of genealogies is a department of the Lyon office unconnected with heraldry, where evidence is taken of the pedigree of applicants, irrespectively of noble or humble lineage, and recorded for preservation.

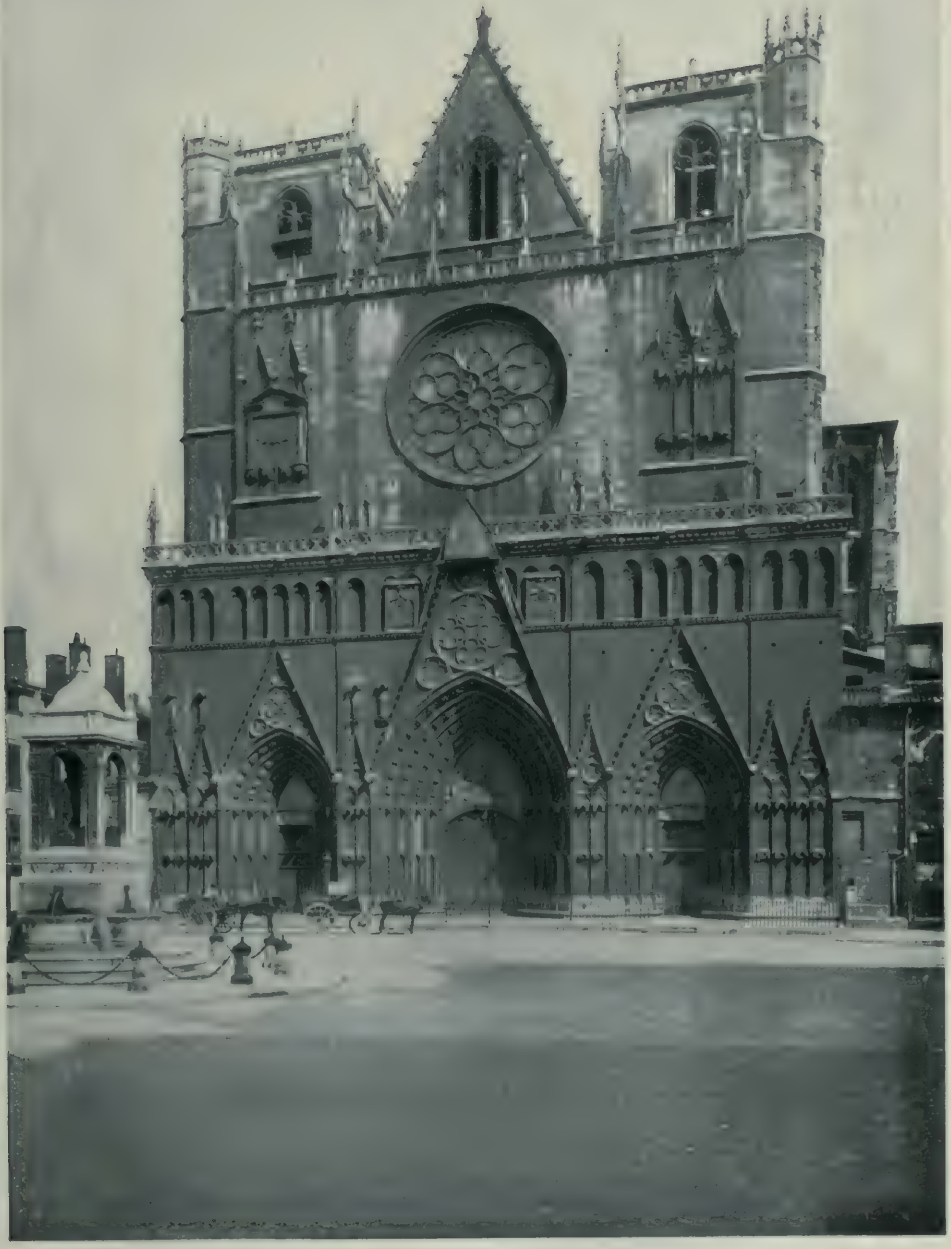
LYON KING-AT-ARMS. The chief heraldic officer of Scotland. He is first mentioned in the early part of the fifteenth century. See HERALD; KING-AT-ARMS.

LYONNAIS, lē̇'ō̇'nā̇'. A former province of France, named after its capital, Lyons, and now comprised in the departments of Rhône and Loire (Map: France, S., J 3). It passed to the Bourbons in 1371, and was only returned under Louis XIII.

LYONNESSE, lĭ'ō-nĕs', **LYONESSE, LEONAIS,** or **LEONNOYS.** A fabulous country mentioned especially in the romances of Tristram and Iseult, supposed to have been contiguous to Cornwall, England. This land of romance has sometimes been identified with the Scilly Isles. Walter Besant laid there the scene of *Armorel of Lyonesse* (1896). See ARTHUR; TRISTRAM; PERCEVAL; LANCELOT OF THE LAKE.

LYONNET, lē̇'ō̇'nā̇', PIERRE (1707–89). A Dutch publicist and entomologist, born at Maestricht. He studied law at Utrecht and became secretary and official interpreter of the States-General at The Hague. His leisure he devoted to the study of natural history. He produced only one important work, *Traité anatomique de la chenille qui ronge le bois du saule* (The Hague, 1760–62), in which the structure of the caterpillar is described in the minutest detail and figured in 18 beautiful plates. This work at once became and has since remained one of the classics of natural history. Another extensive work, published posthumously (1832), is *Recherches sur l'anatomie et les métamorphoses de différent espèces d'insects.* Lyonnet showed ability also as an amateur in sculpture and portrait painting.

LY'ONS (Fr. *Lyon,* Lat. *Lugdunum*). The third city of France in respect of population,



LYONS

THE CATHEDRAL OF ST. JEAN

and second only to Paris in industrial importance. It is the capital of the Department of the Rhône, and is situated at the confluence of the Rhone with the Saône, in lat. 45° 46′ N. and long. 4° 49′ E. (Map: France, S., J 3). Its position, commanding both the Rhone and the Saône, gives it not only a great commercial but also an immense strategic importance. It is a military station of the first class and is surrounded by a circle of fortifications which since 1871 has been improved, extended, and removed farther from the centre of the city, and now has a circumference of 44 miles. The Rhone and the Saône divide Lyons into three parts, the central and most important business section being built on the long, narrow peninsula between the rivers. This peninsula is very low, the southern extremity having been reclaimed from the river in the eighteenth century by the construction of dikes, which along a considerable length of river front protect the city from inundation. The northern part of the peninsula rises abruptly in the hill of La Croix Rousse, and the west bank of the Saône is high and steep, formed by the rugged hill of Fourvières, on the slopes of which stands the old part of the city, still preserving its mediæval aspect. Thirteen bridges lead across the Saône to the middle city, whose centre is the Place Bellecour, the principal square, surrounded by fine façades and containing gardens and fountains, and in the centre a statue of Louis XIV. North of this square are the large commercial establishments, and south of it as far as the Cours du Midi is the aristocratic quarter. The Cours du Midi is a broad opening extending from river to river and planted with trees. South of this, extending to the point of the peninsula, are the large railroad stations, the customhouse, arsenal, prisons, abattoirs, and gas plants. From the middle city 11 bridges cross the Rhone to the extensive, modern, and rapidly growing quarters of La Guillotière and Les Brotteaux, which are the home of the great working population and contain numerous factories. This portion of the city is bordered by a boulevard which ends in the north in the large Parc de la Tête d'Or on the bank of the Rhone, a handsome, rustic pleasure ground of about 285 acres, containing a lake with several islands. At the entrance to the park stands the large Monument des Enfants du Rhône erected to the memory of the heroes of 1870–71. The Place Carnot contains a monument to the French Republic, and the Place des Terreaux a monumental fountain by Bartholdi.

Lyons has preserved the remnants of Roman baths and of a theatre, several tombs, and portions of the Roman wall and of the aqueducts. The oldest building in the city is the church of St. Martin d'Ainay, built on the site of a Roman temple, several columns of which are still preserved in the portal. The cathedral of St. Jean, near the Saône, at the foot of the hill of Fourvières, is one of the finest examples of early Gothic in France. It was begun about 1110, and continued by various architects till 1480. Other mediæval churches of interest are those of St. Nizier, St. Paul, and St. Bonaventure. The church of Notre Dame de Fourvières is a new edifice, finished in 1894, in an eclectic style, with sumptuous decorations. It stands on the summit of the hill west of the Saône and commands a fine view over the city of the peaks of the Jura and the Savoy Alps. The most prominent public buildings are the handsome Hôtel de Ville, built in 1646–55; the Bourse, with a monumental façade, finished in 1861; the Palais des Arts, a vast building, containing a library and various museums; and the Grand Théâtre, whose arcades are occupied by shops.

The University of Lyons, on the Rhone in the quarter of La Guillotière, ranks next to that of Paris among the French universities in the number of its students. (See LYONS, UNIVERSITY OF.) Lyons is the stronghold of French Catholicism. Besides the state university there are four free faculties—science, theology, letters, and law—constituting in reality a Catholic university. In addition there are the Ecole Centrale Lyonnaise, a number of commercial, technical, and industrial high schools, and a national school of fine arts. The municipal library contained, in 1913, 450,000 volumes and 948 incunabula. There are several public hospitals, asylums, and other charitable institutions.

Lyons has been a flourishing industrial centre since the Roman period. Its industries have been fostered from time to time by royal grants of privileges; thus, Francis I granted the workers of Lyons exemption from military service. Although it suffered heavily through emigration after the Revocation of the Edict of Nantes, it still retains its place as the chief centre of the silk industry in the world. One-third of all the raw silk produced in or brought to Europe is prepared in Lyons and its vicinity. Two-thirds of this quantity is imported from the Orient, one-eighth comes from Italy, and only one-tenth is produced in France. About one-half of the prepared silk is used in the local industries, the rest being exported. The total value of the production of the silk industries (manufacturing, dyeing, printing, raw silk, etc.) of Lyons and the surrounding region in 1911 was about $136,000,000. The chief of the allied industries is the manufacture of chemicals, especially of dyes; the annual value of the chemical products amounts to over $20,000,000. There are also extensive ironworks and machine shops and establishments for the preparation of leather and skins, while printing has for centuries been one of the distinctive industries. The commerce of the city is also considerable. Lyons is one of the principal railroad centres of France. It has a large river traffic. The city has 13 miles of quays along the river fronts, and the width of the Rhone at this point is 625 feet, while that of the Saône is from 250 to 450 feet. The principal trade, besides that in silk products, is in grain and wine. Lyons is also, next to Paris, the most important financial centre of France. Its exchange is almost independent of that of Paris, and it has large amounts of capital invested in foreign enterprises. At the head of its financial institutions is the Crédit Lyonnais, which has branches in over 100 cities. The United States is represented by a consul. The population, which before the Revolution was over 200,000, had declined to 109,500 in 1801; in 1891 it was 438,077; in 1901, 459,099; in 1906, 472,114; in 1911, 523,796. The latter figure comprised a municipal population of 502,213 and soldiers, convicts, paupers, certain classes of students, etc., to the number of 21,583. Of the 502,213, the "agglomerated" population numbered 471,496.

Lyons was an ancient Gallic town with the name of Lugdunum, the territory covered later by the town occupied first by the Segusii; in 59 B.C. some Greek refugees came to the district, and called the town established by them Lugudunum or Lugdunum. In 43 B.C. L. Manutius Plancus, a lieutenant of Cæsar, founded a Roman colony on the Fourvière Hill, which soon became the chief colony in Gaul, particularly after Agrippa made it the starting point of four important roads. In 13 A.D. it was made the capital of all the Gallic municipalities, from which deputies gathered annually in the Roman forum built in the city. Christianity rapidly gained ground in the city. The town was destroyed by fire in 59 A.D., but was rebuilt at the expense of Nero, and was later decorated by Trajan, Hadrian, and Antonius. In 197 A.D. it was pillaged by the soldiers of the Emperor Severus. In 208, under Septimius Severus, it witnessed a massacre of many thousands of its Christian citizens, and it was deprived of its title of capital. In the Middle Ages the city was for some time under the rule of counts (counts of Lyonnais, counts of Forez), later under that of the archbishops of Lyons, with whom the inhabitants waged bloody conflicts, and finally, in the fourteenth century, passed under the sway of the French kings. In 1320 it received a municipal charter. Two councils of the Church were held there in 1245 and 1274. In 1793 the people of Lyons rose in insurrection against the terrorism of the Convention. An army was sent against the city, which was taken in October and subjected to a frightful chastisement, thousands of the citizens being massacred at the hands of Collot d'Herbois and Fouché. Many of the finest edifices were demolished. The city gradually recovered under Napoleon, and has since enjoyed prosperity, though it has several times suffered from floods and from labor riots and insurrections, in 1831, 1834, and 1871. Among a long list of celebrities born at Lyons are the emperors Claudius, Caracalla, and Geta, Sts. Irenæus and Ambrose, Philibert de l'Orme, the Coustous, Jussieu, Suchet, Ampère, Meissonier, Say, and Puvis de Chavannes. Consult: Monfalcon, *Histoire monumentale de la ville de Lyon* (6 vols., Lyons, 1865–66); Pariset, *Histoire de la fabrique lyonnaise* (Paris, 1903); Charléty, *Histoire de Lyon* (ib., 1903).

LYONS. A city and the county seat of Rice Co., Kans., 30 miles northwest of Hutchinson, on the St. Louis and San Francisco, the Missouri Pacific, and the Atchison, Topeka, and Santa Fe railroads (Map: Kansas, D 6). It is an agricultural and stock-raising region, with valuable deposits of salt, and, besides large salt works, has grain elevators, two flour mills, ice plant, cement-block factory, etc. The city has a Carnegie library. The water works are owned and operated by the municipality. Pop., 1900, 1736; 1910, 2071.

LYONS. A village and the county seat of Wayne Co., N. Y., 36 miles east by south of Rochester, on the Erie Canal and on the New York Central and Hudson River and the West Shore railroads (Map: New York, C 4). It is a distributing point for coal brought from the Pennsylvania fields; has extensive shops and a roundhouse of the New York Central and Hudson River Railroad; and there are large cooperage plants, grist and planing mills, numerous distilleries of peppermint and other essential oils, a large cold storage plant, a canning factory, a pottery, machine shops, and manufactories of slipper soles, barrels, silk gloves, letter carriers' supplies, and agricultural implements. Valuable water power from the Canandaigua Lake outlet contributes to the industrial importance of the village. There are high-school and civic-club libraries and the Lyons Musical Academy. The water works and sewage plant are owned by the municipality. Lyons was laid out in 1793 and incorporated as a village in 1854. The original Erie Canal, known as the "De Witt Clinton Ditch," passes through here. Pop., 1900, 4300; 1910, 4460.

LYONS, COUNCILS OF. The name applied to two synods received as ecumenical by the Roman Catholic church. The first was held in 1245 by Innocent IV (q.v.), largely for the purpose of discussing the questions at issue between the Pope and the Emperor Frederick II, who had driven the pontiff from Rome. Innocent presided, and the patriarchs of Aquileia, Antioch, and Constantinople, the Emperor Baldwin II of Constantinople, and representatives of several sovereigns were present. Definite provision was made for the support of the Latin Empire in the East, the relief of oppressed Christians in the Holy Land, and the defense of Christendom against the Mongol invaders. A solemn sentence of deposition was pronounced against Frederick II on several grounds, in spite of a vigorous defense by his representative, Thaddæus of Suessa. The second Council of Lyons was convoked by Gregory X immediately after his accession, and met in May, 1274. The Latin patriarchs of Antioch and Constantinople were present, and St. Bonaventura was among the cardinals until his death in July, two days before the last session. The most important objects aimed at were a reconciliation of the Eastern and Western churches and the organization of a new crusade to free the Holy Land. The first object seemed to have been attained when representatives of the Greek bishops and Emperor acknowledged the primacy of the Roman see, the double procession of the Holy Ghost (see FILIOQUE), and the developed doctrine of purgatory. After a Te Deum of thanksgiving the Pope intoned the creed in Latin, and the Greek deputies sang it in Greek, repeating twice the article "who proceedeth from the Father and the Son." The attempted reunion, however, soon proved illusory (see GREEK CHURCH), nor was the Pope able to organize a crusade. Some disciplinary canons were passed, as well as regulations for papal elections. Consult: K. J. von Hefele, *Conciliengeschichte*, vols. v, vi (2d ed., Leipzig, 1886–90); Hauck-Herzog, *Realencyclopädie für protestantische Theologie und Kirche*, vols. vii, ix (3d ed., ib., 1899–1901); Martin, *Bullaire et concilles de Lyon* (Lyons, 1905).

LYONS, EDMUND, first BARON (1790–1858). An English vice admiral and diplomat, born at Burton, Hampshire. He served in the East Indies, and especially distinguished himself by storming the Dutch fortifications at Marrack (1811). In 1828 he blockaded Navarino and in 1833 carried King Otho to Athens from Triest. This service brought him an appointment as Minister at Athens. Upon the outbreak of the Crimean War he was appointed second in command of the Mediterranean fleet. He showed great skill and bravery in his attack on the sea defenses of Sebastopol. In 1855 he succeeded Dundas in chief command. He became vice admiral and received temporary rank as admiral in 1857. Consult S. M. Eardley-Wilmot, *Life of Vice Admiral Edmund, Lord Lyons* (London, 1898).

LYONS, GULF OF (Fr. *Golfe du Lion*). An arm of the Mediterranean, indenting the coast of France and extending from Cabo de Creus on the coast of Spain to the Iles d'Hyères, off the south coast of France (Map: France, S., J 5). Navigation is hindered by numerous sand bars. The coast west of the delta of the Rhone is sandy and bordered with numerous lagoons. The portion east of Cape Couronne is steep and rocky. The chief towns on the Gulf are Marseilles, Toulon, and Cette. The Rhone empties into the Gulf.

LYONS, Richard Bickerton Pemell, second Baron and first Earl (1817–87). An English diplomat. He was born in Lymington, Hampshire, and after a short service as a midshipman with his father, Admiral Lord Lyons, studied at Winchester and later at Christ Church, Oxford, where he took his B.A. in 1838. Upon leaving college he at once entered the diplomatic service as attaché at Athens. There he remained until 1852, when he was transferred to Dresden. The next year he went to Florence, where in 1856 he became Secretary of the Legation and in 1858 Envoy. Appointed British Minister to the United States in December, 1858, he remained at this post throughout nearly the whole period of the Civil War, resigning on account of ill health in February, 1865. His position at Washington, rendered exceedingly difficult by the strained relations between the governments of Great Britain and the United States, he maintained with dignity and great tact. In November, 1861, when called upon to present the demands of Great Britain for the release of Mason and Slidell (qq.v.), the Confederate Commissioners, his moderation and good sense did much to avert a threatened clash. In August, 1865, he was sent as British Ambassador to Constantinople, whence, in 1867, he was transferred in a similar capacity to Paris. He resigned his post at Paris in November, 1887, and died shortly afterward, having been recently created an earl. Consult T. W. L. Newton, *Lord Lyons: A Record of British Diplomacy* (New York, 1913).

LYONS, University of. One of the largest universities in France. It was organized in 1808, at the instance of Napoleon, as a part of the University of France, and up to 1895–96 was known as Facultés de Lyon. In 1913 it consisted of the faculties of law, medicine-pharmacy, mathematics-science, and philosophy. It had an attendance of over 3000 students and a budget of about 1,123,181 francs. The Industrial School of Chemistry (established in 1883), the French School of Tanning (1899), the Central School of Lyons, the Veterinary School of Lyons, and the Catholic faculties of theology (1875), law, mathematics-science, and philosophy, with an attendance of about 600, constitute bodies which form the annexes to the work of the university proper.

LY'RA (Lat., the lyre). A small northern constellation, situated between Cygnus and Hercules, and containing α Lyræ, or Vega, one of the brightest stars in the Northern Hemisphere. β Lyræ, of the third magnitude, is a variable with a period of 12 days, 22 hours; near it is the interesting "ring" nebula. ε Lyræ, of the fourth magnitude, is a fine double-double star, first resolved as such by Sir William Herschel. The apex of the sun's way (q.v.) is situated near Vega.

LYRA, Nicholas of. See Nicholas of Lyra.

LYRE (Fr. *lyre,* from Lat. *lyra,* from Gk. λύρα, lyre). A stringed musical instrument of the ancients, differing from the harp in having fewer strings and from the lute or guitar in having no keyboard. Two branching arms stretched upward from a hollow body, and they were joined by a crosspiece from which the strings were stretched to the bottom of the body. The strings were further supported by a crosspiece upon the body of the lyre. The shape of the body and the number of strings varied greatly, the strings being increased from three (the original number) to 10 or 12. Both the fingers and the plectrum seem to have been used in playing the lyre. As there was no keyboard, each string could give but one tone. The early history of the lyre is involved in considerable obscurity. It is probable that the lyre originated in Assyria, and that both Egypt and Greece derived their instrument from that country. It reached its most perfect form in Greece, but there is little real difference betwen the lyre, the Greek cithara and chelys, and the Jewish kinnor. The modern instrument most nearly akin to the lyre is the Nubian *kissar,* for an illustration of which see Cithara. For the importance of the lyre in the development of Greek musical theory, see Greek Music; and for illustration, see Plate of Musical Instruments. See also Hebrew Music.

LYRE BAT. A small bat (*Megaderma lyra*) of the family Nycteridæ. Huge ears are one of its characteristics. It is common in India and Ceylon, where it is known as vampire, or, more properly, false vampire, and is believed to have bloodsucking habits. It eats not only insects, but attacks smaller bats, frogs, and even small fish, first sucking their blood and then consuming the body. It is exceedingly abundant about old buildings, ruins, and caves, and swarms in the cave temples. Many interesting particulars as to its habits are given in the works of Jerdon, Blyth, Blanford, and other East Indian zoölogists. See Plate of Bats.

LYRE BIRD. The lyre birds (*Menura*) are among the most notable of Australian birds, not merely because of the remarkable tail, but because of certain points in the anatomy which indicate their position among the lowest and least specialized forms of Passeres. These curious birds constitute a family by themselves, the Menuridæ, of which *Menura* is the only genus. They seem to be survivors of a very ancient and now almost extinct branch, whose nearest existing relatives are the Australian scrub birds (Atrichiidæ). Two species are known, both inhabitants of Australia, but retreating before the advance of civilization and becoming greatly reduced in numbers. They are found in the scrub or sparsely wooded portions of unsettled country, are very shy, hard to approach, and difficult to flush. They are rapid runners and always seek to escape in that way. They are good singers and are said to be very capable mimics. In their feeding and other habits they resemble gallinaceous birds and are commonly called pheasants by the colonists. In size they approach the domestic fowl, and the tail is about 2 feet in length (or height) when erected. The color is a sombre grayish brown, with more or less of a rufous cast. The sexes are alike in color, but the female has simply a long, wedge-shaped tail, while the tail of the cock consists of 16 feathers, of which the two outermost are so curved as to form the outline of a lyre, and these have a wide inner vane; the two central feathers are very long and have a vane on one side only and that narrow; the vanes of the remaining 12 feathers are made up of widely separated barbs. This tail is not perfected until the bird has reached its fourth year, and in the semiannual molt following the breeding season is shed, to be renewed about six months later for the next nuptial season. In the best-known species (*Menura superba*) there is little rufous about the plumage, and the outer tail feathers are long and marked with light bars, while in the second species (*Menura alberti*) there is considerable rufous, and the outer tail feathers are short and without bars. Their food consists of insects, snails, etc. The breeding habits of the lyre birds are very remarkable, for they are said to build on the ground a large, well-woven, dome-shaped nest, with an entrance at one side, wherein the female deposits a single egg, which is very dark-colored, as though blotched over with ink. The males also scrape up mounds of earth, where they spend much time strutting about and displaying the tail. A full account, with many bibliographical references, will be found in Newton, *Dictionary of Birds* (London, 1893–96). See Plate of LYRE BIRDS, ETC.

LYRE'MAN. Any of the commoner cicadas, particularly the dog-day harvest fly. See CICADA.

LYR'IC POETRY (Lat. *lyricus*, from Gk. *λυρικός*, *lyrikos*, relating to the lyre, from *λύρα*, *lyra*, lyre). A name given by the Greeks to a kind of nonnarrative poetry chanted or sung to the accompaniment of a lyre. But the term has come to be used much less restrictedly, passing to poetry unaccompanied by music but constructed on the system of musical measure, then to any short poem of limited scope of emotion, without regard to musical adaptation. As regards substance, the term "lyric" has tended to association with emotional expression, standing thus in antithesis to the "epic," the "dramatic," the "didactic," etc.; all of which, however, have always been credited with "lyric" elements. Obviously, then, the term has only a conventional value, inasmuch as all expression, whatever its form and whether in prose or verse, has some degree of emotional or "lyrical" import. Recent æstheticians, in fact, attribute a lyrical character to all art. Recognizing the distinctly individualistic character of the lyric, Aristotelian and neo-Aristotelian criticism held it inferior to the epic and dramatic forms, to which it ascribed a high social and philosophical purpose. On this same theory the lyric was least tampered with by the preceptualists, the rule books of poetry, as those of Italy and Provence, restricting themselves to metrics and prosody. Romanticism has, on the other hand, both in its ancient Alexandrian and modern manifestations, exalted the lyric in itself and, even when holding to distinctions of literary genres, most prized the lyrism of the epic, drama, etc. Perhaps, for our purposes, the most convenient of the artificial definitions of a lyric poem is that of Palgrave, who defines it as one turning "on some single thought, feeling, or situation." The poetry thus circumscribed will be found to utter in the main what is *felt* by the soul, though this feeling may proceed from external causes. It is a cry of the heart, sometimes joyful, sometimes sad. In lyric poetry, description, narrative, and drama have little or no place, for lyric poetry is emotional above all things. It therefore appears later than the epic, when man has become self-conscious. The lyric is rarely of great length, for an emotion is soon spent or changed after a pause for recovery to an emotion of another kind.

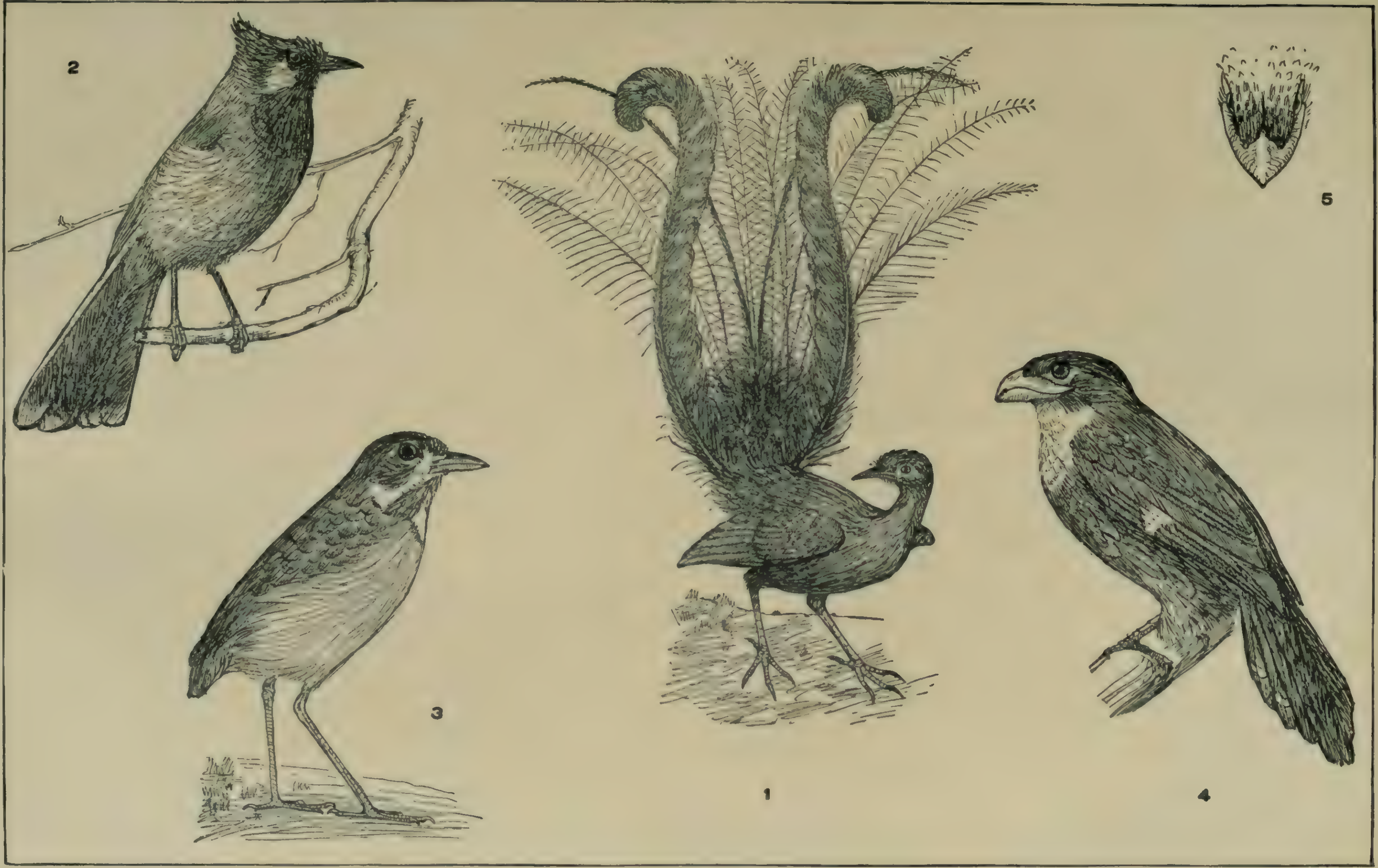
The more objective and impersonal poetry is, the weaker does the lyric element become. On the other hand, despite strong personality or seeming eccentricity, a lyric poet in uttering his individual emotions can hardly help expressing what is felt by other men, and thus the temperament of a race, its fears, regrets, yearnings, its sudden anger, its griefs and hopes, find their outlet in lyric song. If meant to be heard with music, the lyric necessarily follows a beat or measure answering more or less to those of the instrument to whose music it is sung. Thus, in antiquity lyric song was adapted to the lyre or harp. Mediæval singers used other instruments, such as the rebec, viol, bagpipe, and lute. The lute was a favorite instrument in Shakespeare's time. The very barbers kept lutes in order that a waiting customer might while away his time with a lyric song. But little by little the metrical form has taken the place of the instrument, until we have such lyrics as Tennyson's, where an instrumental accompaniment is superfluous, so sufficient is the music of the verse. Shakespearean drama is full of lyric passages, which managers nowadays cut out on the ground that they delay the plot. By Elizabethan audiences the lyrics were relished like the other elements.

Lyric poetry has usually been strongest and best among those races and at those times wherein individuality has manifested itself most potently, for the lyric poet desires first of all to free his heart of his emotion. Hence, also, the lyric is the freest of all poetic forms. It burst out in Greece when the monarchies were yielding to oligarchy and democracy. From the eighth century B.C. to the middle of the fifth a throng of poets were singing in Asia Minor, on the Greek mainland, and amid the isles of the Ionian Sea. Callinus of Ephesus, the creator of the Greek political elegy; Tyrtæus, maker of those elegies which inspired the Spartans as they marched to battle; Mimnermus, composer of erotic elegies, with Solon, Theognis, and Phocylides; Archilochus, Hipponax, and Simonides of Amorgos in the iambic; Anacreon, Alcæus, and Sappho in the love song; and finally Pindar, foremost in choral poetry, are all representatives of the Greek lyric.

In Italy, Horace, Catullus, Tibullus, Propertius, and Ovid put their personal emotions into verse, but lyric poetry never throve among the Romans, whose individuality was hampered by the theory of devotion to the state, nor did they approve of the expression of individual emotion. The Roman soldiery, however, sang satirical verses expressive of their political sentiments as they followed the triumphal chariot of a conqueror; the Romans have left us also a few bits in rhythmic septenarius verse, and their popular songs were probably imitated in the Latin hymns of the Church. For centuries lyric poetry seems to have been kept alive by the lower classes. About 1050 it began to bloom in Provence. At this time, too, it began spontaneously to flourish in France, Sicily, Umbria, and Tuscany, but was influenced in its growth by the poetry of the troubadours. In Umbria Jacopone uttered the emotions of a religious upheaval; in Tuscany Lapo Gianni, Guido Cavalcanti, Cino da Pistoia, and Dante and Petrarch began to sing in a philosophical strain of the multifarious emotions inspired by love.

In northern France Adam de la Halle, Gautier de Coincy, Colin Muset, Conon de Béthune, and others composed lyric poems, but François

LYRE-BIRD, ETC.



1. LYRE-BIRD (Menura superba).
2. YELLOW-EARED BULBUL (Kelaartia penicillata).
3. PROVOST'S ANT BIRD (Grallaria guatemalensis).
4. DUSKY BROAD-BILL (Corydon sumatranus).
5. BILL OF No. 4 from above.

Villon (q.v.) was the first Frenchman to put himself, soul and body, into poesy. The lyricoepic songs, called in the Middle Ages *chansons d'histoire* or *chansons de toile*, with *motets, rotrouenges, rondeaux, ballettes, estampies, virelis*, were well-known Northern forms. The *serventois* was Provençal. The *chanson*, properly so called, also came from the South with the *salut d'amour*, the *tençon*, and the *jeux partis*. After the Pléiade, a partial expression of the Renaissance with its interest in the free growth of personality and its appearance in literature, no lyrics of great value are produced in France, although there is an occasional lyric note in La Fontaine, until lyric poetry began to revive in early Romantics and reached its height in Victor Hugo.

The French *ballade, rondeau, triolet*, and *villanelle* (It. *villanella*) are well known from such English imitations as Austin Dobson's. English poetry before the Norman Conquest was largely narrative, though it was often lyrical in the depth of its emotion. *Deor's Complaint* is the earliest lyric known in Anglo-Saxon. Purely lyric poems appeared in the fourteenth century, a century after Walther von der Vogelweide's patriotic songs and love poems had charmed Germany. To the fourteenth century belong several pretty love poems, beautiful hymns to the Virgin, *ballades, rondels, virelays*, and a series of political songs by Laurence Minot celebrating the exploits of Edward III. In Elizabethan days the lyric assumed the form of the song, the pastoral, the madrigal, and the sonnet. These spontaneous lyrics were succeeded by the love songs of the Cavaliers and the classic lyrics of Milton. After Milton lyric poetry in England was choked by the critics, who were swayed by French influence. Then came Gray, Collins, Chatterton, and the more spontaneous Burns, bringing the long-absent emotional note back to English poetry. While there is no exact information as to the origins of lyric poetry, the documents of literature allow us to follow its development from long before Christ to now. Never had the lyric wider sway than in the nineteenth century, when not only individuals but nations became conscious of their individuality. Goethe and Heine, Lamartine and Hugo, Wordsworth, Keats, Shelley, Tennyson, Browning, Foscolo, and Leopardi, spoke for themselves and their countries; but there is a universality of appeal in their verse which indicates the vigor of this outburst of lyricism. We may take it for granted that lyric poetry will always flourish wherever the inner life is intense and individual.

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LYS, lēs, or **LEYE**, lī′*e*. A tributary of the Scheldt. It rises in France in the Department of Pas-de-Calais and flows in a northeast direction, forming for a short distance the boundary between France and Belgium and joining the Scheldt at Ghent, after a course of 130 miles (Map: Belgium, B 4). It is canalized for 44 miles from the town of Aire, near its source, to the Belgian frontier, and connects with an extensive canal system through which some of its water flows into the North Sea at Ostend. In the European War of 1914 the Lys River was the scene of terrific battles between the allies and the Germans. During the struggle for the seacoast the Lys protected the right flank of the former and was crossed and recrossed several times in the seesaw battles fought in its valley. See War in Europe.

LYSAN′DER (Lat., from Gk. *Λύσανδρος*, *Lysandros*) (?–395 B.C.). A Spartan general, son of Aristocritus. In 407 B.C. he was appointed to the command of the Spartan fleet and defeated the Athenians near the promontory of Notium. When his year of office had expired, he was succeeded by Callicratidas, who was defeated in 406 B.C. at Arginusæ (q.v.). In 405 Lysander was again put in virtual command; but, that the rule might be preserved which prescribed that no one should be *nauarchus* twice, he had, as a nominal superior, an officer named Aracus. In the same year he overwhelmed the Athenian fleet at Ægospotamos (q.v.) and afterward sailed to Athens; the city surrendered in the spring of 404 B.C., and the Peloponnesian War was thus brought to an end. Lysander was now the most powerful man in Greece, and sought everywhere to establish Spartan supremacy and, apparently, to make himself supreme in Sparta. His pride, arrogance, and vanity evoked vigorous opposition to his plans. The Spartan ephors (see Ephori) deposed him from his command and called him home to answer to charges of insubordination. He escaped answering to the charges, and in

395 B.C. he was sent in command of an army against the Bœotians, headed by Thebes, and was killed in the battle of Haliartus. It is said that he was at the time laying plans to overthrow the reigning dynasty at Sparta. Lysander was an able and courageous general, but his ambition was wholly personal, and he was thoroughly unscrupulous. His life was written by Plutarch and by Cornelius Nepos.

LYSA′NIAS. 1. A king of the Ituræans, with his capital at Chalcis, who reigned from 40 to 36 B.C. His father was Ptolemy, son of Mennæus. He was put to death by Mark Antony in 36 B.C., and his kingdom was divided and given away by the Romans. Many scholars have held that he is referred to by a mistake in Luke iii. i, but there are at least some indications of a later Lysanias. 2. A tetrarch Lysanias is mentioned in an inscription found at Abila (q.v.), recording the building of a street and a temple by a freedman of his, Nymphæus. The date is not given, but the prayer for the welfare of the Augusti (*κύριοι Σεβαστοί, kurioi Sebastoi*), in the opinion of Schürer, cannot be earlier than the time of Tiberius and Livia. As Josephus distinguishes between the territories of Chalcis and Abila, it is natural to suppose that Lysanias of Abilene (q.v.) was not the king of the undivided Ituræan realm, but the ruler of the district around Abila in the time of Tiberius, and that Luke iii. 1 refers to this tetrarch. While the evidence is not such as to force the conclusion, there is strong probability in favor of this view. Consult Holtzmann, *Die Synoptiker* (3d ed., Tübingen, 1901), and Schürer, *Geschichte des jüdischen Volkes*, vol. i (4th ed., Leipzig, 1901).

LYSIAS, lĭsh′ĭ-*as* (Lat., from Gk. *Λυσίας*) (c.450–380 B.C.). The third in point of time of the 10 Attic orators of the Canon Alexandrinus (q.v.). His father was Cephalus, a wealthy Syracusan, who was induced by Pericles to move to Athens, where he became a resident alien, the friend of Socrates and other eminent Athenians. The scene of Plato's *Republic* is laid at the house of Cephalus' eldest son, Polemarchus, in the Piræus. At the age of 15 Lysias with his brother Polemarchus went to the Athenian colony of Thurii in southern Italy. There he studied rhetoric, probably under Tisias. In 412 B.C., when the failure of the Sicilian expedition of the Athenians had given the anti-Athenian party supremacy in Thurii, Lysias and his brother, accused of Attic sympathies, returned to Athens and carried on there a large shield-manufacturing business. During the distracted period under the rule of the Thirty (404–403 B.C.; see THIRTY TYRANTS), the brothers' large possessions excited the rapacity of the governing body; their house was attacked by armed men while Lysias was entertaining some friends, their property seized, and Polemarchus put to death; Lysias, however, by bribing the soldiers who had him in ward, escaped to Megara. From Megara he assisted Thrasybulus in freeing Athens of the tyrants and came back in 403, when the democrats gained the upper hand.

On his return he prosecuted Eratosthenes, one of the Thirty, as his brother's murderer, in a speech still extant, but the result of the prosecution is unknown. Lysias now entered on the business of logographer, a writer of speeches for others to deliver, in which he attained great success. Of the 34 (35) extant orations only the oration *Against Eratosthenes* was spoken by Lysias himself. In all the rest there is an extraordinary adaptation to the peculiar conditions and characters of the speakers, the value of which before a jury Lysias was the first logographer to appreciate. His native "plain style," which the ancients praised, was no doubt fostered by the simple character of his clients. The chief excellences ascribed to Lysias by Dionysius of Halicarnassus are his purity in diction, brevity, clearness, simplicity, vividness, propriety, and charm. Everywhere his consummate art conceals the art with which the speeches were composed. In antiquity 425 speeches were attributed to him; the rhetoricians of Augustus' day regarded 233 of these genuine; we know the titles of but 172. Only 31 have been preserved entire; of three more, large fragments are quoted by Dionysius; and there is found in Plato's *Phædrus* a speech on "Love." There are, besides, only a few scanty fragments. Lysias' literary activity ended with 380 B.C., and he probably died soon after. The best modern editions are by Bekker (Berlin, 1823), Baiter and Sauppe (Zurich, 1839–43), Scheibe (Leipzig, 1835), Cobet (Amsterdam, 1863), and Thalheim (Leipzig, 1901). Selected orations, with English notes, by Stevens (Chicago, 1876), Schuckburgh (4th ed., London, 1890), Bristol (Boston, 1892), Morgan (ib., 1895), and Wait (New York, 1898). There is a poor English translation by Gillies. Consult: F. W. Blass, *Attische Beredsamkeit*, vol. i (2d ed., Leipzig, 1887); R. C. Jebb, *Attic Orators*, vol. i (New York, 1880); W. L. Devries, *Ethopoiia: A Rhetorical Study of the Types of Character in the Orations of Lysias* (Baltimore, 1892); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1908).

LYS′IAS. Regent of Syria under Antiochus Epiphanes, noted for the wars he carried on against the Jews. His great army was defeated by Judas Maccabæus (q.v.) near Emmaus (166 B.C.). In the following year he was repulsed near Bethsura, but captured that fortress (163 B.C.) and besieged Jerusalem. He was compelled to withdraw by an insurrection at Antioch and shortly after was murdered by the populace.

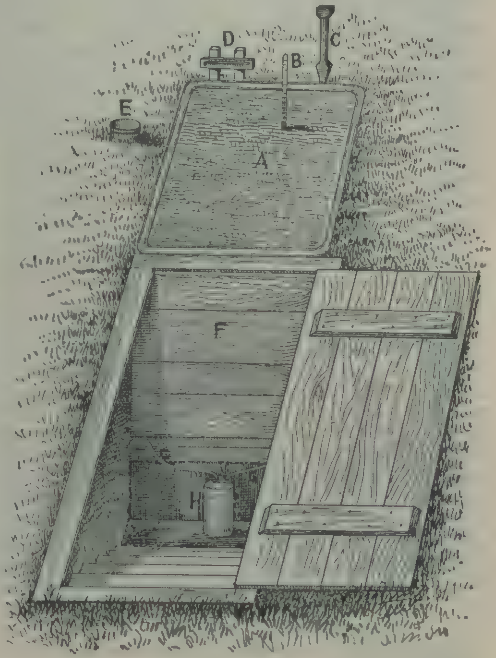
LYSIC′RATES (Lat., from Gk. *Λυσικράτης*, *Lysikratēs*), CHORAGIC MONUMENT OF. A beautiful monument in Athens, in the form of a round shrine, and one of the earliest examples of Corinthian architecture. It was dedicated to Dionysus by Lysicrates, as winner in the choral contest in the Dionysiac Games (334 B.C.), and was surmounted by the bronze tripod which was the usual prize in that contest. The monument, which is the only surviving one of a large number of similar structures which lined the ancient Street of Tripods, stands on a cubical base 13 feet high. The exterior of the circular temple of Pentelic marble, 9 feet in diameter and 21½ feet high, is adorned with six Corinthian engaged columns and the upper portion is surrounded by a band decorated with tripods in relief. The roof is formed of a single block of marble, carved in a leaf pattern, and terminates in a superb foliated and branched finial, on which the tripod rested. The frieze, about 10½ inches high, represents the punishment by Dionysus of the Tyrrhenian pirates, who are being beaten by satyrs and changed into dolphins. The building, because of its shape, was popularly known as the Lantern of Demosthenes.

LYSIMACHIA, lĭ′sĭ-măk′ĭ-ȧ (Lat., from Gk.

λυσιμάχιον, *lysimachion*, a medicinal herb, supposed to be named in honor of Λυσίμαχος, *Lysimachos*, Lysimachus, a king of Thrace, but more probably from λυσίμαχος, loosing strife, from λύειν, *lyein*, to loose + μάχη, *machē*, strife), or LOOSESTRIFE. A genus of plants of the family Primulaceæ, or primrose family, including about 70 species, most of them natives of the Northern Hemisphere. They are leafy-stemmed perennials, generally with yellow flowers, axillary or in a terminal raceme. Species grow in nearly all parts of the world, several in the United States, some being cultivated in gardens, as the moneywort (*Lysimachia nummularia*), which was introduced from Europe. In this the leaves are roundish, small, with short petioles; peduncles axillary, one-flowered, ovate, acute sepals. It is a beautiful plant for hanging baskets and for covering rocks and also for carpeting beneath shrubs, forming, as it does, a thick mat. In some places it has escaped from the gardens into damp ground. It blooms from July to September. The two species introduced from Europe which are commonly found in American flora are *Lysimachia vulgaris* (golden loosestrife, or willow herb) and *Lysimachia punctata* (spotted loosestrife). The common indigenous species are *Lysimachia quadrifolia* (crosswort) and *Lysimachia terrestris* (bulb-bearing loosestrife). The other species formerly referred to the genus have now become species of *Steironema*, which includes five native American loosestrifes.

LYSIM'ACHUS (Lat., from Gk. Λυσίμαχος) (c.360–281 B.C.). A general in the army of Alexander the Great. He was born at Pella, Macedonia, and in his youth was distinguished for bravery and physical strength. When the Empire of Alexander was divided at his death (323 B.C.), Lysimachus received Thrace, of which he took possession after conquering Seuthes, the King of the country. In 314 B.C. he joined the league formed against Antigonus (q.v.) by Ptolemy, Seleucus, and Cassander. In 306 B.C. he took the title of King. Together with Seleucus he overwhelmed Antigonus and Demetrius Poliorcetes in the battle of Ipsus (301 or 300 B.C.), and thereupon appropriated the northwest part of Asia Minor. Nine years later he attacked the Getæ, north of the Danube, but was defeated and taken prisoner, and was released only on giving his daughter in marriage to the King of the Getæ. In 288 B.C. he combined with Ptolemy, Seleucus, and Pyrrhus against Demetrius. The last part of the life of Lysimachus was embittered by domestic troubles. After he had put to death his son Agathocles at the instigation of his wife Arsinoë, the people of Asia Minor rose in rebellion, and, assisted by Seleucus, defeated and killed him in the battle of Corupedion.

LYSIMETER, lī-sĭm′ê-tẽr (from Gk. λύσις, *lysis*, a dissolving + μέτρον, *metron*, measure), or DRAIN GAUGE. A device for collecting and measuring the water (rain) percolating through soils and for the study of the composition of drainage water. It is essentially a water-tight box or cylinder of definite content, as a cubic yard or meter, or inclosing a definite area, as $\frac{1}{1000}$ or $\frac{1}{8000}$ acre, to a given depth, sunk into the soil to a level with its top, and provided with a bottom so arranged that the percolating water may be drawn off and collected in a suitable receiver for measurement and examination. In some cases the boxes are placed in pits dug to receive them and filled with the soil removed from the pits. Generally the purpose, however, is to maintain the conditions in the lysimeter as nearly like those in the natural soil outside as possible, and in this case the lysimeter box or cylinder is forced into the soil and its bottom adjusted without disturbing the inclosed soil, or the box is built around an undisturbed block of soil. The most notable work with lysimeters has been done by Lawes, Gilbert, and Warington at Rothamsted, England; by Dehérain at Grignon, France; at the Ploti experiment station in Russia; by Gerlash at the agricultural institute of Bromberg, Germany; by Eckhart in Hawaii; and in America by Stockbridge at the Agricultural College, Amherst, Mass., Sturtevant, Babcock, and Goff at the Agricultural Experiment Station, Geneva, N. Y., and Lyon at Cornell University. The Rothamsted drain gauges were constructed by digging a trench in the soil, gradually undermining the soil at the desired depth, and putting in perforated iron plates to support the mass. The plates were kept in place by iron girders, the ends of the plates and the girders being supported by brickwork. Trenches were then dug around the blocks of soil and these were inclosed in walls of brick laid in cement. A zinc funnel of the same area as the block of soil was fixed to the perforated iron bottom to collect the drainage water and conduct it into a suitable receptacle. The gauges were $\frac{1}{1000}$ acre in area, and 24.40 and 60 inches deep in different cases. A lysimeter 3 feet deep and inclosing an area of $\frac{1}{8000}$ acre, constructed by Stockbridge at Amherst, is shown in the figure. Observations with the lysimeters at Rothamsted during 20 years showed that on the average slightly less than one-half of the rainfall escaped in the drainage of bare soils, the proportion varying slightly with the different



STOCKBRIDGE LYSIMETER.

A, soil in lysimeter; *B*, soil thermometer; *C*, air thermometer; *D*, air thermometer; *E*, rain gauge; *F*, front of lysimeter; *G*, rubber tubes to conduct water from pipes drawing the bottom of the lysimeter to water jar, *H*.

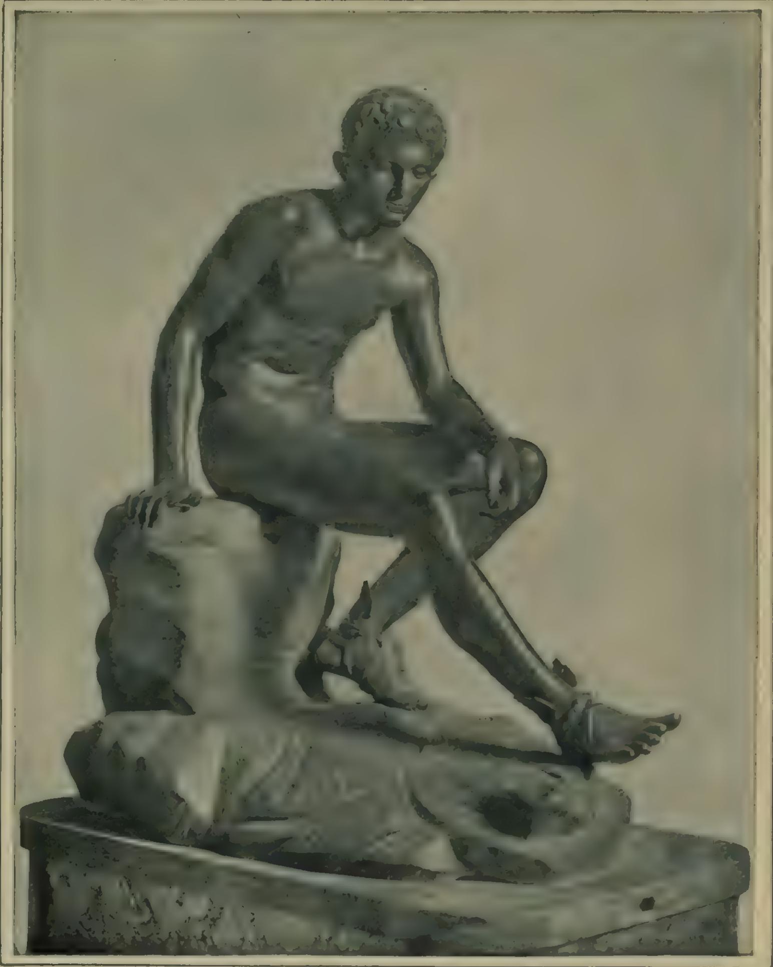
depths. In observations made by Klucharov at Moscow, Russia, on bare soils inclosed in metal cylinders driven into the soil, approximately one-fourth of the rainfall percolated through a depth of 20 centimeters of soil. With soils covered with plants the percolation was much less. Stockbridge found that about one-fifth of the rainfall percolated through a bare drift soil 3 feet deep. Sturtevant concluded from observations made at Geneva that lysimeters as ordinarily constructed do not give results applicable to soils in their natural condition, mainly because the soil in the lysimeter is not in connection with a permanent water table. He attempted to overcome this objection by constructing a lysimeter provided with an artificial water table. With such a lysimeter the drainage was approximately 37 per cent of the rainfall under sod, 41 per cent with bare soil, and 43 per cent with soil cultivated 3 inches deep. While it is doubtful whether lysimeters even with the greatest care in their construction and management give results representing accurately the conditions actually obtaining in natural soils, they have proved valuable for comparative scientific studies, not only on percolation, but on the losses of soil constituents in drainage and on the process of nitrification (q.v.) in soils. Cameron, however, has called attention to the fact that drainage water obtained from lysimeters does not have the same composition as the true soil solution (film water). For further information on the subject, consult: Stockbridge, *Investigations in Rainfall, Percolation, and Evaporation* (Boston, 1879); New York State Experiment Station Reports, 1882, 1887, 1888, 1890; Gilbert, "Observations on Rainfall, Percolation, and Evaporation," in *Rothamsted Memoirs*, vol. vii (London, 1890); Dehérain, "Les eaux de drainage des terres cultivés," in *Annales Agronomiques*, vol. xix (Paris, 1893); F. K. Cameron, "The Rôle of the Lysimeter in Soil Solution Studies," in *Eighth International Congress of Applied Chemistry, Proceedings*, vol. xv (1912).

LYSIP′PUS (Lat., from Gk. Λύσιππος). A celebrated Greek sculptor. A native of Sicyon in the Peloponnesus, he was at first a worker in bronze and then applied himself to statuary, becoming the head of the Sicyonian school and the founder of a new style which was at the basis of a large part of the sculpture of the Hellenistic age. The dates of his birth and death are not known, but he was an older contemporary of Alexander the Great, whom he long survived. His artistic activity thus falls in the last part of the fourth century. He claimed to have had no master, but to have learned his art from a study of the famous Doryphorus of Polyclitus. In fact, he seems to have taken that work as his starting point and to have developed a new system of bodily proportions in which he united many of the characteristics of the Attic and the Peloponnesian schools. (See Greek Art.) His statues were marked by a small head, long legs, slender figure, and fine naturalism in the treatment of the hair. His pupil Xenocrates, whose treatise on art aimed to exalt his master as the culmination of Greek art, claimed that he was the first to represent men as they really were. Such statues are numerous in the marble copies of our museums, and many have been brought into connection with Lysippus. The most celebrated is the Apoxyomenos (q.v.) of the Vatican, which represents a young athlete using the strigil, or flesh scraper, after the bath. The ascription of this work to Lysippus has, however, been questioned recently by E. A. Gardner, *Six Greek Sculptors*, 220 ff. (London, 1910). Another undoubted copy is the marble group of Daochos the Thessalian and his ancestors, discovered by the French at Delphi, which, as is shown by inscriptions, must reproduce the bronzes of Lysippus set up by Daochos at Pharsalus. One of these statues, that of Agias, is discussed at length by E. A. Gardner, *Six Greek Sculptors*, 217 ff. (London, 1910). His portraits of Alexander were celebrated, and he was said to be the only artist in bronze to whom the King would sit. It seems probable that the bust of Alexander in the Louvre and perhaps the bronze mounted Alexander from Pompeii are based on Lysippean originals. During the excavations conducted by the Italians at Cyrene (q.v.) after the Archæological Institute of America was forced to stop its excavations there, there was found, late in 1914 or early in 1915, an excellent statue of Alexander the Great, 7½ feet high, of Parian marble, which may well be a copy of a work by Lysippus, or at least to have been inspired by his school. (Consult: *Art and Archæology*, vol. i, p. 212 (Baltimore, 1915); the New York *Tribune*, Feb. 10, 1915; the *Times*, Feb. 11, 1915.) He is said to have produced 1500 statues, all in bronze and some of large size, and to have given special attention to the technical details of the casting. He executed the equestrian statues of 25 Macedonians who fell at the passage of the Granicus, which Metellus transported to Rome; a fine bronze statue of Cupid, with a bow; several statues of Jupiter, one of which, 60 feet high, was at Tarentum; one of Hercules, which was removed to Rome; the sun god, drawn in a chariot by four horses; "Opportunity" (Kairos), represented as a youth with wings on his ankles on the point of flying from the earth. Of these we have had, until lately, no certain traces, unless, as is not improbable, a standing Hercules in the Pitti Palace is derived from this source. The same type distorted into the overdeveloped athlete appears in the later well-known Farnese Hercules by Glycon. To Lysippus or his immediate followers may also be attributed the Silenus holding the infant Dionysus, of which there are several extant copies, and the seated Hermes in bronze from Herculaneum. Consult: Reinhard Kerkule von Stredonitz, *Die griechische Skulptor* (Berlin, 1906); E. A. Gardner, *Six Greek Sculptors* (London, 1910); id., *A Handbook of Greek Sculpture* (ib., 1911); H. H. Powers, *The Message of Greek Art* (New York, 1913); Winter, in Gercke and Norden, *Einleitung in die Altertumswissenschaft*, vol. ii (2d ed., Leipzig, 1913).

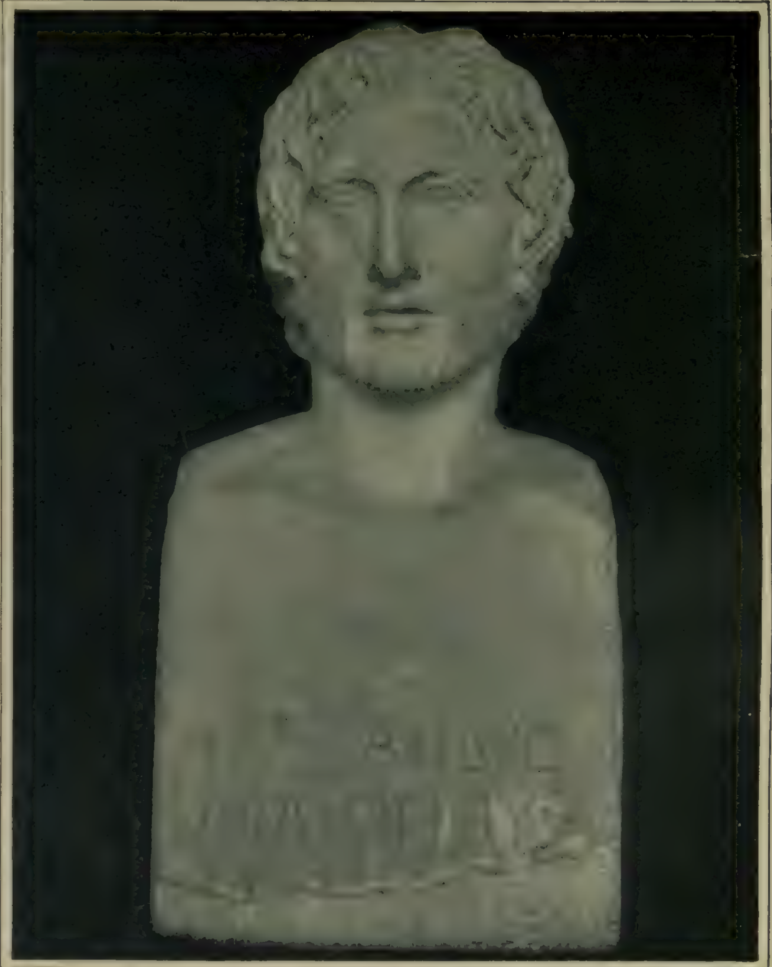
LY′SIS. See Crisis.

LYSKANDER, lụ-skăn′dẽr, Claus Christophersen (1558–1623). A Danish poet and historian, born in Skaane. He studied theology at Copenhagen, Wittenberg, and Rostock and lived nearly all his life as pastor at Herfölge. Besides Latin poems, he wrote some rhymed chronicles: *Danske Kongers Slægtebog* (1622), a sort of genealogy of Danish kings, intended as a preface to a history of Denmark which he planned to write; and *De Scriptoribus Danicis*, which appeared in the *Monumenta Inedita Rerum Germanicarum* (1753), and is a list of all Danish writers up to his time. Consult H. F. Rördam, *Lyskanders Levned* (Copenhagen, 1868).

LYSIPPUS



HERMES RESTING, Bronze in National Museum, Naples. School of Lysippus.



ALEXANDER THE GREAT, from the Original in the Louvre, Paris. Attributed to Lysippus.

LY'SOL (from Gk. λύσειν, *lysein*, fut. of λύειν, *lyein*, to loose). A brown, oily, clear liquid with an odor resembling that of creosote but less pronounced. It is prepared from tar oil by saponification, and contains about 50 per cent of cresols. It is soluble in water, alcohol, chloroform, glycerin, and benzine. With water it forms a clear, frothy, soapy liquid. This property is a disadvantage in surgical work requiring the use of instruments, as it renders them somewhat slippery. For purposes where a lubricant is desired it is a useful antiseptic for the hands in a 1 to 2 per cent solution. Its chief value is found in obstetrical work.

LYSONS, lī'sonz, Daniel (1762–1834). An English topographer and antiquary, born in Gloucestershire, where his father was rector of Rodmarton and Cherrington. He studied at Bath Grammar School and at St. Mary Hall, Oxford, where he graduated B.A. in 1782 and M.A. in 1785. He was appointed curate of Mortlake in 1784, and in 1790 curate of Putney, Surrey. He is best known for his *Environs of London* (4 vols., 1792–96), undertaken through the encouragement of Horace Walpole, to whom it was dedicated. He also began the preparation of a work entitled *Magna Britannia, being a Concise Topographical Account of the Several Counties of Great Britain* (1806–22), of which only six volumes were published. His further publications include *Select Psalms* (1799) and *A View of the Revenues of the Parochial Clergy of this Kingdom* (1824). He was a brother of Samuel Lysons.

LYSONS, Samuel (1763–1819). An English archæologist, brother of Daniel Lysons, born at Rodmarton, Gloucestershire. He was educated for the bar, but relinquished the law for antiquarian pursuits. He was made Keeper of the Records of the Tower of London in 1803 and of the Society of Antiquaries in 1812. He published *Roman Antiquities Discovered at Woodchester* (1797) and *Reliquiæ Britannico-Romanæ* (1801–17). He wrote also for the *Archæologia*, and assisted his brother Daniel in the preparation of the *Magna Britannia*.

LYS'SA, LYS'SOPHO'BIA. See Hydrophobia.

LYSTRA, lĭs'trȧ (Lat., from Gk. Λύστρα). A city of Lycaonia (q.v.) in Asia Minor. It is worthy of note in sacred history as the birthplace of Timothy and the place where Paul received divine honors and soon after was stoned (Acts xiv. 6–20). It was in the western part of the great plain of Lycaonia, eight hours from Iconium, the modern Konieh (q.v.), and is now known as Khatün Serai. It was identified by an American exploring party in 1886. Some had sought to identify it with the ruins of Bin-bir-Kilisseh.

LYTE, Henry Francis (1793–1847). A Scottish hymn writer, born at Ednam, near Kelso. He graduated from Trinity College, Dublin, where he became scholar (1813), took orders, and was a curate for 25 years at Brixham, Devonshire. Lyte died at Nice, Nov. 20, 1847. He was the author of many favorite hymns, perhaps the best known of which is "Abide with me, fast falls the eventide." His *Miscellaneous Poems* were published with a memoir by his daughter (London, 1868).

LYTHRA'CEÆ (Neo-Lat. nom. pl., from *Lythrum*, from Gk. λύθρον, *lythron*, gore), The Loosestrife Family. A family of plants including about 20 genera and 400 species, widely distributed, but most abundant in tropical America. The plants are herbs, shrubs, and often trees in tropical regions. The family is characterized by its mostly opposite leaves, solitary or clustered axillary flowers, the persistent calyx generally inclosing the ovary although free from it, and the stamens inserted on the throat of the calyx. The most notable foreign representatives of the family are the pomegranate (*Punica*) and crape myrtle (*Lagerstrœmia*). The principal indigenous genera are *Ammannia*, *Decodon* (swamp loosestrife), *Lythrum* (loosestrife), and *Cuphea*.

LYTH'RUM (Neo-Lat., from Gk. λύθρον, *lythron*, gore; so called from the crimson or purple color of the flowers). A genus of herbaceous plants belonging to the family Lythraceæ and including about 30 species. *Lythrum salicaria*, or spiked loosestrife, is a European perennial, but is found in wet meadows, particularly in New England and eastern New York, where it is frequently cultivated; leaves lanceolate, heart-shaped at the base, sometimes whorled in threes; stamens 12—twice the number of petals —6 long and 6 short. It is a fine, tall, rather downy plant, with large flowers, from crimson to purple. By growing in dry places the plant becomes more downy and hoary, and considerably dwarfed. It has a mucilaginous, astringent taste. The blackish-brown, branching, and fibrous root is also astringent, mucilage and tannin being its principal constituents. It is mentioned in some pharmacopœias. The principal species indigenous to the United States are *Lythrum hyssopifolia*, a low annual, from 6 to 10 inches high, the petals pale purple, found in marshes on the coast of New England and New Jersey; *Lythrum alatum*, a tall and wandlike perennial, with leaves from oblong-ovate to lanceolate, and deep purple flowers, which grows from Michigan and Wisconsin southward; *Lythrum lineare*, a slender species, from 3 to 4 feet tall, bushy at the top, with short, linear, chiefly opposite leaves, whitish petals, which grows in brackish marshes in New Jersey and southward. Under cultivation these plants improve greatly, and a number of kinds are offered by florists. They are of easy cultivation, growing readily and flowering freely in moist soil.

LYTLE, lĭt'l, William Haines (1826–63). An American soldier and poet. He was born in Cincinnati, Ohio, graduated at Cincinnati College in 1843, studied law and began practice, but, having soldierly antecedents, he entered the Mexican War as a lieutenant, was chosen captain of the Second Ohio Regiment, and soon after the war was elected to the State Legislature. Before the Civil War he had become major general of militia and in 1861 was commissioned colonel of the Tenth Ohio. He was severely wounded in September, 1861, and soon after resuming active service was again wounded and taken prisoner, Oct. 8, 1862, but was soon exchanged, having meanwhile been made brigadier general of volunteers, Nov. 29, 1862. He was then actively engaged with the Army of the West till he was killed leading a charge of his brigade at Chickamauga. Lytle is also well remembered through his poem, *Address of Antony to Cleopatra*, beginning "I am dying, Egypt, dying." His *Poems* were edited with memoir by Venable (Cincinnati, 1894).

LYTTELTON, lĭt''l-ton. A seaport of South Island, New Zealand, on Port Lyttelton, in the

Province of Canterbury, 7 miles by rail southeast of Christchurch (q.v.), of which it is the port (Map: New Zealand, South Island, D 4). It has extensive harbor accommodations, including a graving dock, and is the outlet for the exports of the region, the chief trade being in frozen mutton. Pop., 1901, 4023; 1911, 5274.

LYTTELTON, Alfred (1857–1913). An English politician. He was educated at Eton and at Trinity College, Cambridge, was called to the bar in 1881, and was Recorder of Hereford in 1894 and of Oxford from 1895 to 1903. He was elected to Parliament in 1895 and in 1903 became Secretary for the Colonies in the Balfour cabinet. In 1905 he promulgated a draft constitution for the Transvaal, but the ministry fell before it was put into effect. With most of the Unionist chiefs he was defeated in the general elections of January, 1906, but reentered the House of Commons on a by-election in June and was a member until his death. He became Royal Commissioner on the Port of London and on Alien Immigration, and chairman of the Transvaal Concessions Commission.

LYTTELTON, Edward, Lord. See Littleton.

LYTTELTON, George, first Baron (1709–73). An English statesman and author, born at Hagley, Worcestershire. He was educated at Eton and at Christ Church, Oxford, entered Parliament in 1730, held several high political offices, and distinguished himself in debate. Among his works are: *Observations on the Conversion and Apostleship of Saint Paul* (1747), a treatise on Christian evidences; *Dialogues of the Dead* (1760); *History of the Life of Henry II* (1767–71). His verse was chiefly included in *Poetical Works* (1785).

LYTTELTON, George William, fourth Baron (1817–76). An English statesman and scholar, born in London. He was educated at Eton and at Trinity College, Cambridge. He was Undersecretary of State in 1846, and later chairman of the Canterbury Association, which sent Church of England colonists to New Zealand; was principal of Queen's College, Birmingham, first president of the Birmingham and Midland Institute, a founder of the Saltby Training School, a member of the Public Schools Inquiry Commission (1861), and Chief Commissioner of Endowed Schools (1869). He and Gladstone married the sisters Mary and Catherine Glynne. He wrote *Ephemera* (1864–72), a series of political, religious, and miscellaneous essays. Consult W. E. Gladstone, *Brief Memorials of Lord Lyttelton* (London, 1876).

LYTTELTON, Thomas, second Baron (1744–79). An English politician, known as the "Wicked Lord Lyttelton," son of Baron George Lyttelton. He was born at Hagley, Worcestershire, and was educated at Eton and at Christ Church, Oxford. In 1768 he was elected to Parliament, from Bewdley, Worcestershire, but early in the following year was unseated on petition. In 1774 he took his seat in the House of Lords. He is mentioned, for his lax morality, in Combe's *Diaboliad*, but was a man of ability and is among the reputed authors of the *Letters of Junius*. Consult the *Quarterly Review*, vol. xc (London, 1852).

LYT'TON, Lady Constance Georgina (1869–). An English woman-suffrage leader, the daughter of the first Earl of Lytton (q.v.). She was born at Vienna, where her father held a diplomatic post. She became an active member of the Women's Social and Political Union. In February, 1910, she was imprisoned for one month for her part in a deputation to Mr. Asquith at the House of Commons; and in October of the same year she was sentenced to one month in jail for throwing a stone at Mr. Lloyd-George's automobile. She went on a "hunger strike" and forced the authorities to release her in two and a half days. Her efforts to obtain the release of suffrage prisoners in January, 1911, sent her to prison, where, refusing food, she was fed by force; and in November of the same year she was in prison for the fourth time for breaking the windows of a post office. She published *Prisons and Prisoners* (1914), an account of her personal experiences.

LYTTON, Edward George Earle Lytton Bulwer. See Bulwer-Lytton, Edward.

LYTTON, Edward Robert Bulwer-Lytton, first Earl of (1831–91). A poet and statesman, only son of the novelist Bulwer-Lytton (q.v.) and best known under his pseudonym Owen Meredith. He was born in London, Nov. 8, 1831, and was educated at Harrow and at Bonn, where he devoted himself to modern languages. After long service as diplomatist at Washington, where he was private secretary to his uncle, Lord Dalling (1849), at Florence, Paris, The Hague, Madrid, Vienna (1868–72), Constantinople, Lisbon, and other places, he was appointed by Lord Beaconsfield to be Viceroy of India (1876). The memorable events of his administration were the proclamation of the Queen as Empress of India, the great famine, and the Afghan War. A man of immense energy and resources, he inaugurated many internal reforms in the government of India. In 1880 he resigned and returned to England. His administration of India was harshly criticized. He was even accused of being a puppet of Downing Street. Time, however, wrought a change. His political opponents came to admire him. On the death of his father (1873) he became Baron Lytton and in 1880 was made Earl of Lytton. In 1883 he published the first two volumes of a biography of his father. This biography, unfortunately, breaks off with the year 1832. The son's frankness would have been put to a severe test had he candidly followed his father's career from 1832 on. From 1887 till his death, Nov. 24, 1891, he was British Ambassador at Paris. Among his many volumes of verse are: *Clytemnestra* (1855); *The Wanderer* (1857), containing his best lyrics; *Lucile* (1860), a very popular novel in verse, avowedly borrowed in part from George Sand's *Lavinia*. *Lucile* is in rhyming anapæstic couplets, and therefore an interesting experiment in English literary history. Lytton himself rather disapproved of *Lucile*. *Tannhäuser*, written in collaboration with Julian Fane (1861), imitations of Tennyson; *Serbski Pesme* (1861), imitations of Servian songs; *Orval, or the Fool of Time*, a work of importance because it is the only English reflection of the mystical poetry of Poland that arose after the extinction of Polish liberty (1869); *Fables in Song* (1874); *Glenaveril* (1885), a novel in verse; and *King Poppy* (1892), are other significant works. Consult: *Selections from Poems*, with preface by Betham-Edwards (London, 1890); E. E. Balfour, *History of Lord Lytton's Indian Administration, 1876–1880* (ib., 1899); *Personal and Literary Letters*, edited by E. E. Balfour (New York, 1906).

M

M The thirteenth letter in the English alphabet. In form it is derived from the North Semitic 𐤌 through the Greek and Latin M, with little variation to the present time. Its form in the Runic futhark, for example, is ᛗ, where it stands as the twentieth rune and is called *Mann*. The Greek name for the letter, *mu*, comes from *mu* (water), a Canaanitish word. Cf. ALPHABET.

Phonetic Character. Phonetically *m* is a labial-nasal sound made by pursing the lips together and vibrating the vocal chords, at the same time allowing some nasal resonance. Popularly *m* and *n* are classed with liquids and semivowels. The sound *m*, particularly in the initial position, has been subject to but slight variations from the time of Indo-Germanic unity to the present, as Indo-Germanic **mātēr*, Sanskrit *mātar*, Greek *μήτηρ*, Latin *mater*, Old Irish *mathir*, Old Church Slavic *mati*, Anglo-Saxon *mōdor*, English *mother*. Sometimes *m* is subject to the same doubling as other consonants. In vulgar speech it is occasionally pronounced with an almost vocalic value, thus *helm* as *helum*, *chasm* as *chazum*.

As a Symbol. In Roman notation M = 1000; M with a dash over it = 1,000,000. In academic degrees M. stands for Master (*magister*), as A.M.; for Medicine in M.D. (*Medicinæ Doctor*); for Member in M.P., Member of Parliament.

MAARTENS, mär′tĕns, MAARTEN (real name, JOZUA MARIUS WILLEM SCHWARTZ) (1858–1915). A novelist of Dutch birth. His stories, written in English, won fame in England and America and were later translated into Dutch. Maarten's boyhood was passed in England, his school years in Germany, his university period in Holland, where he studied law at Utrecht. He afterward spent much time in Paris and on the Riviera, but for the most part resided near Utrecht, observing Dutch life minutely, yet with a cosmopolitan detachment that led some to regard his descriptions as disproportionate, and so unjust. His first novel, *The Sin of Joost Avelingh* (1889), was clever and successful both with critics and with the public. The public was fascinated by the story, the critics were won by the well-knit analysis of motive. The same qualities unite in *An Old Maid's Love* (1891) and *A Question of Taste* (1891), which mark a stylistic advance. *God's Fool* (1892) is a novel distinctly superior to any of its predecessors. *The Greater Glory* (1894) was the first to gain for Maartens that general and cosmopolitan recognition that has been accorded also to *My Lady Nobody* (1895) and to his later novels: *Her Memory* (1898), *Some Women I Have Known* (1899), *My Poor Relations* (1903), *Dorothea* (1904), *The Healers* (1906), *The Woman's Victory* (1906), *The New Religion* (1907), *Brothers All* (1909), *Price of Lis Doris* (1909), *Harmen Pöls* (1910), *Eve* (1912). In all his books the moral idea dominates.

MAAS, mäs. An affluent of the Rhine. See MEUSE.

MAAS, NICOLAS. See MAES, NICOLAS.

MAÁSIN, mȧ-ä′sĭn. A seaport of Leyte, Philippines, situated on the extreme southwest coast of the island 76 miles south-southwest of Tacloban (Map: Philippine Islands, E 5). It is a handsome and well-built town, and exports hemp. Pop., 1903, 16,805.

MAASS, mäs, ERNST (1856–). A German classical scholar, born at Kolberg, Pomerania. He studied at Tübingen and at Greifswald; in 1880–82 traveled in Italy, France, and England; in 1886–95 was professor at Greifswald; and thereafter was professor of classical philology in the University of Marburg (rector, 1909–10). His studies cover a wide field, but he is best known for his investigations in Greek and Roman religion and for his works on Aratus (q.v.). Among his writings are: *De Sibyllarum Indicibus* (1879); *De Biographis Græcis* (1880); *Affreschi scenici di Pompeji* (1882); *Parerga Attica* (1889); *Scholia in Iliadem Townleyana* (1889); *De Æschyli Supplicibus* (1890); papers on Aratus (1888, 1892, 1893, 1898); *Orpheus* (1895); *Analecta Sacra et Profana* (1901); *Griechen und Semiten auf dem Isthmus von Korinth: Religionsgeschichtliche Untersuchung* (1902); *Die Tagesgötter in Rom und den Provinzen* (1902); *Mutter Erde* (1908); *Die Braut von Messina und ihr griechisches Vorbild* (1908); *Heilige Nacht* (1910); *Die Schmerzensmutter der Antike* (1912); *Goethes Medea* (1913).

MAASSEN, mäs′en, FRIEDRICH BERNHARD CHRISTIAN (1823–1900). An Austrian jurist, born at Wismar and educated at Jena, Berlin, Kiel, and Rostock. In 1855 he was made professor of Roman law at Pest, and in the same year at Innsbruck. In 1860 he became professor of both Roman and canon law at Graz, and 11 years later at Vienna. In 1873 he became a member of the Academy of Sciences. His works include *Geschichte der Quellen und der Litteratur des kanonischen Rechts* (1870) and *Neun Kapitel über freie Kirche und Gewissensfreiheit* (1876).

MAASTRICHT, mä'strĭkt. A city of the Netherlands. See Maestricht.

MAAT, or **MAT**, mät. An Egyptian goddess of truth and justice, daughter of the sun or of Phthah. She guides the souls of the dead to Osiris. Maat is represented with the ostrich feather, the hieroglyph for "mat" (truth), on her head. Consult Bridge, *The Gods of the Egyptians* (London, 1904).

MAB (OIr. *medb*, Queen of Connaught, mentioned in Irish poems of the twelfth century; incorrectly but commonly connected with Welsh *mab*, child). In Celtic folklore, the midwife of the fairies. In *Romeo and Juliet* (I, iv) she is represented as the Queen of the Fairies, and her office, poetically transformed, is to deliver men's minds of fancies and dreams. She appears in Dryden's *Nymphidia* and also in the poems of Ben Jonson, Herrick, and others. She furnished the title to Shelley's *Queen Mab*, where rule over the thoughts of men is one of her attributes. Consult Halliwell, *Illustrations of the Fairy Mythology of A Midsummer Night's Dream* (Shakespeare Society Publications, London, 1845).

MABA, mä'bȧ. Semicivilized Negroid tribes in the Sultanate of Wadai, in the heart of the Sudan, between Baghirmi and Darfur. They are the ruling people in the territory which was formerly called Dar Maba. Great interest attaches to them because of their share in the bloody war waged by the Mohammedanized inhabitants against the pagan negroes. Nearly all the many tribes in the sultanate belong to the former class. More than 500 years ago Moslem Arabs were in the country and won the Mabas to their faith. Consult Keane, *Africa* (London, 1895).

MABALÁCAT, mä'bȧ-lä'kȧt. A town of Luzon, Philippines, in the Province of Pampanga (Map: Luzon, C 6). It is situated on the Manila-Dagupán Railroad, 16 miles north of Bacolor. Pop., 1903, 7049.

MABERY, mā'bĕr-ĭ, Charles Frederic (1850–). An American chemist. He was born at North Gorham, Me., graduated at the Lawrence Scientific School, Harvard, in 1876, and from 1874 to 1883 acted as assistant in chemistry there. He held the chair of chemistry in the Case School of Applied Science, Cleveland, Ohio, from 1883 to 1911, when he retired. In the *American Chemical Journal* he published the results of his researches in the laboratory at Cambridge. After he removed to Cleveland he became associated with the electric production of aluminium. In this connection he invented a new method for the preparation of anhydrous aluminium chloride.

MA'BIE, Hamilton Wright (1846–1916). An American essayist, editor, critic, and lecturer, born at Cold Spring, N. Y. He graduated from Williams College in 1867 and from the Law School of Columbia University in 1869. In 1879 he joined the editorial staff of the *Christian Union*, afterward called the *Outlook*, of which he became associate editor. American culture is indebted to him for helping to spread, by his lectures as well as his writings, a love of good reading in the United States. His books, with one or two exceptions, comprise essays or familiar talks on literature, nature, and the spiritual life. He received honorary degrees from his own alma mater, from Union College, and from Western Reserve and Washington and Lee universities, and was made a member of the American Academy of Arts and Letters. His writings include: *Norse Stories, Retold from the Eddas* (1882); *Nature in New England* (1890); *My Study Fire* (two series, 1890 and 1894); *Short Studies in Literature* (1891); *Under the Trees and Elsewhere* (1891); *Essays in Literary Interpretation* (1892); *Essays on Books and Culture* (1897); *Essays on Work and Culture* (1898); *The Life of the Spirit* (1899); *William Shakespeare, Poet, Dramatist, and Man* (1900); *A Child of Nature* (1901); *Works and Days* (1902); *Parables of Life* (1902); *Essays on Nature and Culture* (1904); *Backgrounds of Literature* (1904); various books for children written or edited by him (1905–08); *Introductions to Notable Poems* (1909); *American Ideals, Character, and Life* (1913); *Japan To-Day and To-Morrow* (1914).

MABILLEAU, mȧ'bē'yō', Léopold (1856–). A French economist, born at Beaulieu (Indre-et-Loire). He taught in a number of French institutions, in 1906 becoming professor at the National Conservatory of Arts. He also held important offices in various associations for mutual and social betterment, serving, e.g., as director of the Musée Social; became an Officer of the Legion of Honor; and lectured with great success in the United States on social and economic questions, especially on coöperation. A number of his works were crowned by the Academy of Moral and Political Sciences. His principal writings include: *Victor Hugo* (1893; 5th ed., 1911); *Histoire de la philosophie atomistique* (1895); *La prévoyance sociale en Italie* (1898); *La coopération en France* (1900); *La mutualité française, doctrine et applications* (1904); *Notions élémentaires d'instruction civique de droit usuel et d'économie politique* (1912), with E. Levasseur and E. Delacourtie. He contributed to French periodicals and edited the works of several authors.

MABILLIER, mȧ'bē'lyȧ', Etienne de Grellet de. See Grellet, Stephen.

MABILLON, mȧ'bē'yôɴ', Jean (1632–1707). A learned French Benedictine. He was born at Saint-Pierremont in Champagne, became a member of the Congregation of Saint-Maur in 1653, and gave his life to historical research. For 20 years he worked at Saint-Germain-des-Prés, Paris, where most of the literary work of the Maurists was done. In 1682 and 1683 Colbert sent him to Burgundy and Germany to collect documents relative to the history of France, and in 1685–86 he was sent to Italy for a similar purpose. The results were published in the *Vetera Analecta* (4 vols., 1675–85) and *Musæum Italicum* (2 vols., 1687–89). He also published *Acta Sanctorum Ordinis Sancti Benedicti* (9 vols., 1668–1702); *Annales Ordinis Sancti Benedicti* (6 vols., 1703–39); *De Re Diplomatica* (1681; new ed. by Adimari, Naples, 1789). For his life, consult: Chavin de Malan (Paris, 1843); Jadart (Rheims, 1879); Bäumer (Augsburg, 1892); also Emmanuel Broglie, *Mabillon et la société de l'abbeye de Saint Germain des Prés à la fin au dix-septième siècle, 1664–1707* (2 vols., Paris, 1888); "Mélanges et documents publiés à l'occasion du 2e centenaire de la morte de Mabillon," in *Archives de la France monastique*, vol. v (Ligugé, 1908); Paul Denis, *Dom Mabillon et sa méthode historique* (ib., 1910); Arthur Bauckner, *Mabillons Reise durch Bayern im Jahre 1683* (Munich, 1910).

MABINI, mȧ-bē'nê, Apollinario (?–1903).

A Philippine insurgent, of the Tagalog tribe, educated in the Catholic College at Manila, where he displayed remarkable intellectual abilities. He entered the Spanish public service, from which he resigned in 1896, when he was advocate of the public treasury. He immediately devoted himself to the Philippine insurrection, suffered imprisonment for nine months, getting no trial from the Spanish authorities, and then openly joined the revolutionary army, being associated with Aguinaldo, Rizal, and Agonchillo. Although he was completely crippled by paralysis, he became the soul of the movement during Aguinaldo's temporary defection, then was the general's private counselor, and for a short time acted as Minister of Foreign Affairs in the revolutionary cabinet and as head of the Supreme Court. He was considered by many to have been the ablest man produced by the revolution—the thinker of the entire movement. He opposed the Malolos Constitution on the ground that for the time the Filipinos required a strong one-man government and on account of the fact that it failed to separate church and state. Although desirous of independence, he finally came to urge English as the language for the Philippines. He surrendered in 1899, but refused to take the oath of allegiance until his return from exile in January, 1903. Consult Dean C. Worcester, *The Philippines Past and Present* (new ed., 2 vols., New York, 1914), and *Philippine Insurrection Records* in War Department Archives.

MABINOGION, măb'ĭ-nŏ'gĭ-ŏn (Welsh, sing. *mabinogi*, probably derived from *mabinog*, pupil of a bard), THE. The title of a series of Welsh prose tales from *The Red Book of Hergest*, published by Lady Charlotte Guest in 1838. The Welsh text was accompanied by an English translation and explanatory notes, and the collection soon became the best-known monument of mediæval Welsh literature. Its contents, however, are far from being homogeneous. The tales differ greatly in age and subject matter, part of them standing beside the old Irish sagas as representatives of very early Celtic tradition, while others seem to come from French sources and belong to a highly developed stage of Arthurian romance. Only a small part of the collection is strictly entitled to be called Mabinogion at all. But, as a result of Lady Guest's choice of title, the term has come to be loosely and inaccurately applied to almost any prose tale of the Middle Welsh period. In the interpretation of the name, as well as in its application, Lady Guest was in error. She took the word *mabinogi* to mean a "nursery tale," and consequently adapted her translation somewhat to the uses of children; but probably the word comes rather from *mabinog* (or *mebinog*), a literary apprentice, or a young man who receives instruction from a qualified bard. The *mabinogi* was apparently the collection of tales which he was expected to know and which constituted his stock in trade. In one case, however, it should be said, the term is applied to a tale where it seems to have reference to the age of the hero; the apocryphal "Gospel of the Infancy" is called *Mabinogi Jesu Grist*.

The four genuine mabinogion, perhaps more accurately to be called the "four branches of the mabinogi," are the following: *Pwyll, Prince of Dyfed; Branwen, Daughter of Llyr; Manawyddan, Son of Llyr;* and *Math, Son of Mathonwy*. These tales go back, so far as their substance is concerned, to the very earliest period of Welsh tradition. They are even held by some to contain a body of material common to the Gaels and Britons, the two great branches of the Celtic world. Arthur and his court are unknown to these ancient tales.

Among the remaining tales (not strictly mabinogion) published by Lady Guest, several contain primitive elements and have been only half adjusted to the conditions of the Arthurian world. An example of this class is the story of *Kilhwch and Olwen*. The tales of *Owen and Lunet, Peredur ab Efrawc*, and *Geraint and Enid*, on the other hand, are the product of mediæval chivalry and are generally held to go back to French originals.

The Red Book of Hergest, from which Lady Guest derived her Welsh text of all these tales, is a manuscript written at different times, from the early part of the fourteenth till the middle of the fifteenth century. But some of the tales are preserved, in whole or in part, in manuscripts of the thirteenth century; and the present opinion is that the collection as a whole was put into its present shape as early as the end of the twelfth century. Certain minor interpolations may be assigned to the fourteenth century. The dialect is that of South Wales.

Bibliography. Lady Guest's edition (1837–49; reprint, 1877) has been superseded in large measure by the more accurate text of Rhys and Evans, *The Text of the Mabinogion and Other Welsh Tales from the Red Book of Hergest* (Oxford, 1887), and by the translation of J. Loth, *Les Mabinogion du livre rouge de Hergest, avec les variantes du livre blanc de Rhydderch* (2 vols., Paris, 1913). Consult also the edition of Lady Guest's translation with notes by Alfred Nutt (London, 1904 and 1910). On the history of the tales, consult the introductions to the works already cited; and cf. Stephens, *Literature of the Kymry* (London, 1873); Ernest Rhys, *Studies in the Arthurian Legend* (Oxford, 1891); E. Anwyl, in the *Zeitschrift für celtische Philologie*, vols. i and ii (Halle, 1897–98); Thomas Bulfinch, *Age of Chivalry* (New York, 1901); I. B. John, *The Mabinogion* (London, 1901); Magnus Maclean, *The Literature of the Celts* (Glasgow, 1906); E. Anwyl, "The Value of the Mabinogion for the Study of Celtic Religion," in *International Congress for the History of Religions, Transactions* (Oxford, 1908); Richard Edens, *Erec-Geraint: der chrétien'sche Versroman und das wälsche Mabinogi* (Rostock, 1910); E. J. Lloyd, "The Mabinogion as Literature," in *Celtic Review*, vol. vii (Edinburgh, 1911). A brief account of this subject may be found in Morrica, *Manual of Welsh Literature* (Bangor, 1909). See WELSH LITERATURE.

MABLY, mȧ'blē', GABRIEL BONNOT DE (1709–85). A French writer. He was the elder brother of Condillac (q.v.) and was born at Grenoble, March 14, 1709. He was educated for the priesthood, but resigned the priestly calling and became secretary of his uncle, Cardinal de Tencin, and attached to the bureau of the Minister of Foreign Affairs. He was a student of political science, generally from the point of view of the Encyclopædists; his theories go beyond Rousseau into a bold communism. Among his discussions of such questions should be cited *Entretiens de Phocion* (1763) and *Doutes proposés aux philosophes économistes* (1768). In 1784, in a publication entitled *Observations sur le gouvernement et les lois des Etats-Unis d'Amérique* (Eng. trans., London, 1784), he predicted the early downfall of the United States. In his old age he saw in everything proof that the world was going to the bad and obtained the surname of Prophet of Evil. He died in Paris, April 23, 1785. His complete works were reprinted, with his life, in 24 volumes (Paris, 1797). Consult: Guerrier, *L'Abbé de Mably, moraliste et politique* (Paris, 1886); Edgard Allix, "La philosophie politique et sociale de Mably," in *Revue des Etudes historiques*, vol. lxv (ib., 1899); Pierre Teyssendier de la Serae, *Mably et les physiocrates* (Poitiers, 1911), containing a bibliography.

MABOUIA, mȧ-bo͞o′yȧ (Brazilian name). A gecko of the tropical parts of South America, *Hemidactylus mabouia*. See Colored Plate of LIZARDS.

MABUCHI, mä′bo͞o′chė (1693–1769). A Japanese scholar, the first of the three distinguished men of learning (Motoöri and Hirata being the others) who attempted to restore the native faith of Japan, Shinto, to its original purity. It had long been obscured by Buddhism and the Chinese philosophy when Mabuchi, influenced by a love of antiquity, began his labors. He attacked the foreign faiths and advocated a return also to the social simplicity of ancient times, conforming his mode of life to his teachings. He first made the ancient poetry of Japan accessible to modern students, and he added greatly to the knowledge of the past. He was a voluminous writer.

MABUSE, mȧ′bụz′, JAN (c.1470–c.1533–36). A Flemish historical and portrait painter, a pioneer of the Italian style of Flanders. His real name was Jan Gossart, but he adopted the name of Mabuse from his native town Maubeuge (Hainault). His early works show the influence of Gerard David. The details of his life are uncertain. It is presumed that in 1503 he was admitted to the guild of painters at Antwerp and was in the service of Philip of Burgundy, whom he accompanied to Rome in 1508. While in Italy he adopted the style of the Italian Renaissance painters, especially as regards the human form—retaining, however, the robust Flemish types, their brilliant color, and minuteness of detail. At the death of Philip, in 1524, he entered the service of Adolphus of Burgundy, whom he accompanied to Middelburg in Zeeland. It is thought that he painted for Christian II of Denmark his dwarfs and children, and also portraits of other royal personages. He died between 1533 and 1536, presumably at Middelburg. After his visit to Italy his work became somewhat mannered and he used rich architectural backgrounds. He is one of the most important figures in the transition period from the art of the Flemish primitives to that of the seventeenth century. Good examples of his early period are an "Adoration of the Kings," in the National Gallery, London, and a "Madonna Enthroned," in the Museum at Palermo. His later works include: "Adam and Eve," Hampton Court, England, and Berlin Museum; "Neptune and Amphitrite," Berlin Museum; "Danaë and the Golden Shower," Munich Gallery; "Jean Carondelet," Louvre, Paris; "St. Luke Painting the Virgin," Rudolfinum, Prague, and Vienna Museum. The Metropolitan Museum, New York, possesses "Adam and Eve" and a Madonna. Among his best portraits are those of Anna van Bergen, in the Gardner collection, Boston, and a series in the National Gallery, London. Consult Ernst Weisz, *Jan Gossart, gen. Mabuse, sein Leben und seine Werke* (Parchim, 1913).

MACA, mä′kȧ. A group of tribes of uncertain linguistic classification wandering in the forest region on the eastern slope of the Andes in central Ecuador. They depend chiefly on hunting, but also cultivate some corn, yucca, and tobacco. They build huts of palm leaves and make pottery. Their various subtribes are constantly at war with each other, their weapons being spears and blowguns, with poisoned arrows. Like the Jivaro and other tribes, they dry the heads of slain enemies.

MACABEBE. A town of Luzon, Philippine Islands, in the Province of Pampanga. It is situated in the delta of the Río Grande de la Pampanga, 6 miles southeast of Bacolor and 9 miles north of Manila Bay (Map: Luzon, E 7). Pop., 1903, 14,405.

MACABI, mȧ-kä′bė. See LADYFISH.

MACABRE, mȧ-kä′br′, DANSE. See DEATH, DANCE OF.

McADAM, măk-ăd′am, JOHN LOUDON (1756–1836). A famous highway engineer of Scotland, who originated the method of macadamizing roads. He was born at Ayr, Scotland, Sept. 21, 1756, but passed his youth in New York. His interest in road construction was aroused while serving as a road trustee in Ayrshire. After much experimentation, largely at his own expense, he reached the conclusion that broken stones supplied the best material for road construction when applied in a specified manner. In 1798 he removed to England and in 1815 was appointed to superintend the roads of the Bristol district. In 1827 he was appointed general surveyor of the metropolitan roads and, in reward for his exertions to render them efficient, received a grant of £10,000 from the government. His system rapidly became general throughout England and was also introduced into France with great success. His work became famous, and his two books, *A Practical Essay on the Scientific Repair and Preservation of Roads* (1819) and *Present State of Road-Making* (1820), were widely read. See ROAD.

McADOO, măk-ȧ-do͞o′. A borough in Schuylkill Co., Pa., 5 miles by rail south of Hazleton, on the Lehigh Valley and the Pennsylvania railroads (Map: Pennsylvania, J 5). It contains the picturesque Tresckow Water Falls and Silver Brook Hollow. Anthracite coal mining and the manufacture of shirts are the principal industries. Pop., 1900, 2122; 1910, 3389.

McADOO, WILLIAM GIBBS (1820–94). An American jurist, born near Knoxville, Tenn., the father of William G. McAdoo. (See below.) He graduated in 1845 at East Tennessee University and in 1845 and 1846 was a member of the State Legislature. In 1847 he served in the Mexican War, subsequently was admitted to the bar, and from 1851 to 1860 was Attorney-General of the Knoxville Judicial District. During the Civil War he served as a captain in the Confederate army and in 1871 became judge of the Twentieth Judicial District of Georgia, to which State he had removed before the war. He published a volume of poems and (with Prof. H. C. White) *Elementary Geology of Tennessee.*

McADOO, WILLIAM GIBBS (1863–). An American lawyer, financier, and cabinet officer, a son of William Gibbs McAdoo. He was born at Marietta, Ga., and was educated at the University of Tennessee, leaving, however, at the end of his junior year to take up the study of law. In 1882 he became a deputy clerk in the United State Circuit Court for the southern division of the Eastern District of Tennessee, and three years later he was admitted to the bar. As a lawyer for the Richmond and Danville Railroad, he became interested in transportation problems, so much so that he left the practice of law temporarily in order to reconstruct the transit system of Chattanooga. In 1892 he moved to New York, where he reëntered the legal profession with his brother. In 1902 he again became interested in transportation systems as president of the Hudson and Manhattan Railroad Company, which acquired the old abandoned tunnel under the Hudson River, begun in 1874. In this work he evinced much ability in negotiating for franchises in New York and New Jersey and remarkable originality and skill in engineering when directing the construction of the Hudson Tunnels. Without training as an engineer he had undertaken a task that experienced men had pronounced inexpedient and even impossible. In 1904 the first tunnel under the Hudson River was completed under his management, an event which was celebrated as a great achievement in engineering; the fourth tunnel was finished in 1909. McAdoo's management of the finances of this $70,000,000 undertaking received high praise. The affairs of the company were directed with success and brought satisfaction to the public. McAdoo resigned the presidency in 1913. In 1910, when there occurred a deadlock in the negotiations for the construction of the proposed subway system for New York City, McAdoo caused surprise by proposing to operate and equip a city-built plant—an offer which was alleged to have brought the capitalists to terms. These successes caused McAdoo to be prominently mentioned for the nomination for Governor of New York in 1910 by the Democratic party; he was strongly favored by the progressive element. He was a delegate to the Democratic National Convention at Baltimore in 1912 and was a strong supporter of Woodrow Wilson. After Wilson's nomination he was made vice chairman of the National Committee, and during a large part of the presidential campaign, when the chairman, McCombs, was ill, he directed the campaign. In 1913 President Wilson appointed him Secretary of the Treasury, and the designation was widely approved. As Secretary, perhaps his most important service was with respect to the passage of the Currency Bill and the formation of the Regional Reserve Banking system. By the law he was made a member of the Federal Reserve Board. McAdoo was considered to be one of the closest advisers of President Wilson, and it was alleged that he, rather than Senator O'Gorman or other New York men, influenced the patronage for that State. A factional quarrel in the Senate over appointments was the outcome. McAdoo's first wife was Sarah H. Fleming, of Chattanooga, Tenn. In 1914 he married Eleanor Wilson, the youngest daughter of the President.

McAFEE, măk'ȧ-fē, Cleland Boyd (1866–). An American Presbyterian clergyman and theologian, brother of Joseph Ernest McAfee. Born at Fulton, Mo., he was educated at Park College (A.B., 1884), at Union Theological Seminary, New York, and at Westminster College, Mo. (Ph.D., 1892). From 1888 to 1901 he served as professor of mental and moral philosophy at Park College, was pastor of the Forty-first Street Presbyterian Church, Chicago (1901–04), and of the Lafayette Avenue Church, Brooklyn (1904–12), and in 1912 became professor of didactic and polemic theology at McCormick Theological Seminary, Chicago. He published: *Where He Is* (1899); *Wherefore Didst Thou Doubt?* (1900); *Faith, Fellowship, and Fealty* (1902); *The Growing Church* (1903); *The Mosaic Law in Modern Life* (1906); *Studies in the Sermon on the Mount* (1910); *The Greatest English Classic* (1912); *"His Peace"* (1913); *Westminster Confession of Faith* (1914).

McAFEE, Joseph Ernest (1870–). An American Presbyterian leader, brother of Cleland Boyd McAfee. He was born at Louisiana, Mo., graduated from Park College in 1889, and studied at Union (1889–90), Auburn (1891–93), and Princeton (B.D., 1896) theological seminaries. At Park College he was an assistant in Greek in 1890–91 and in 1893–96, professor of Greek from 1896 to 1900, and chaplain and professor of the history of religion and ethics in 1900–06. From then until 1914 he was associate secretary of the Presbyterian Board of Home Missions in the United States and thereafter served as cosecretary of the board, with special charge of the educational work among recent immigrants. In this department he advocated the introduction of modern sociological methods. He is author of *Missions Striking Home* (1908) and *World Missions from the Home Base* (1911).

MACAHUBA (mä'kȧ-hōō'bȧ) **PALM**. See Macaw Tree.

MACAIRE, ma-kâr'. A mediæval *chanson de geste*, which dates from about the twelfth century. The theme of the chanson is the persecution of Blanchefleur, wife of Charlemagne, by Macaire de Losane. In its present form it is a translation, in a mixture of French and Venetian dialects, and was published in 1856 by F. Guessard. Robert Macaire is a modern type of rogue in French comedy. The character was developed by Frédéric Lemaître into a fantastic type of thief and assassin. There is a melodramatic farce in three acts, by Robert Louis Stevenson and W. E. Henley, entitled *Macaire*. Consult François Guessard, *Les anciens poètes de la France*, vol. ix (Paris, 1866), and Joseph Bédier, *Les légendes épiques*, vol. ii (ib., 1908).

McAL'ESTER. A city in Pittsburg Co., Okla., about 62 miles south of Muskogee, at the junction of the Missouri, Kansas, and Texas and the Chicago, Rock Island, and Pacific railroads (Map: Oklahoma, F 4). The city's prominent buildings include the State penitentiary, Carnegie library, post office, and courthouse. There are extensive coal mines in the region. The city is engaged chiefly in coal mining and coke making, is a centre for wholesale trade, and has cotton gins, a large cotton compress, iron foundries, brick plants, a flour mill, and manufactories of brass beds, brooms, mattresses, macaroni, etc. It was formerly called South McAlester, but in 1906, upon the annexation of the village of McAlester, the latter name was adopted for the city, a commission form of government being adopted. Water works are municipally owned. Pop., 1900, 3479; 1910, 12,954; 1920, 12,095.

McALESTER, Miles Daniel (1833–69). An American soldier, born in New York City. He graduated from West Point in 1856, entered the engineer service, and was made first lieutenant in 1861. He became in October, 1862, chief engineer of the Department of the Ohio. He later served with General Grant in the siege of Vicksburg and took part in the operations against Mobile. He was brevetted colonel, April 23, 1864, and a year later brigadier general. He continued in the engineer service after the war closed.

MACALESTER COLLEGE. A coeducational institution of learning under Presbyterian control in Macalester Park, St. Paul, Minn., founded in 1884. It consists of a college granting degrees of B.A. and B.S., and an affiliated conservatory of music granting the degree of B.M., a diploma, and a certificate. In 1913–14 the total attendance was 400, about evenly divided between men and women. The library contained 13,600 volumes. The faculty numbered 37. The college buildings with the grounds are valued at $379,279. The income was $45,000, and the endowment $558,000. The president in 1914 was T. M. Hodgman, A.B., LL.D.

MACALISTER, ALEXANDER (1844–). A British anatomist. He was born in Dublin, was educated at Trinity College, Dublin, and became professor of zoölogy in 1869 and of anatomy and surgery in 1877 at Dublin. In 1883 he went to Cambridge as professor of anatomy. In the *Journal of Anatomy and Physiology* (vols. xxxiii–xxxv) he wrote on the early history of anatomy; and he contributed important papers to the *Transactions* of the Royal Irish Academy. Among his separate publications are: *Introduction to Animal Morphology* (1876); *Morphology of Vertebrate Animals* (1878); *Textbook of Human Anatomy* (1889).

MACALISTER, SIR DONALD (1854–). A Scottish physician. He was born in Perth and was educated at Aberdeen, Liverpool, St. John's (Cambridge), St. Bartholomew's Hospital, and Leipzig University. He taught mathematics at Harrow, lectured at St. Bartholomew's in 1879, was Goulstonian lecturer (1887) and first Croonian professor (1888) at the Royal College of Physicians, and in 1907 became principal and vice chancellor of Glasgow University. He was knighted in 1908 and received honorary degrees from many universities. Macalister was president of the General Medical Council, held office in various other distinguished bodies, and, as chairman of the British Pharmacopœia Committee, edited the *British Pharmacopœia* (1898, 1900). He edited Ziegler's *Pathological Anatomy* (1883; new ed., 1896–97), and wrote *Nature of Fever* (1887); *Antipyretics* (1888); *Advanced Study and Research in Cambridge* (1903); *Echoes* (1907).

MACALISTER, JAMES (1840–1913). An American educator, born in Glasgow, Scotland. He came to the United States in 1850 and graduated from Brown University in 1856 and from the Albany Law School in 1864. He served as superintendent of the public schools in Milwaukee, Wis., in 1874–81, as regent of the normal schools of Wisconsin in 1878–83, and as the first superintendent of the Philadelphia public schools in 1883–91. Thereafter until 1911 he was president of Drexel Institute. He lectured at Johns Hopkins University in 1893 and at the College of the City of New York in 1894. His educational writings include: *Manual of Primary Instruction* (1884); *Course of Instruction in United States History and Civil Government* (1887); *Manual Training in the Public Schools of Philadelphia* (1890); *Art Education in the Public Schools* (1893).

McALL, mak-ạl′, ROBERT WHITAKER (1821–93). An English Congregational minister, founder of the McAll Mission in France. He was born in Macclesfield, was educated at the University of London (1847), and held pastorates in various English cities until he was 50. At that time, while minister of a Congregational church in Hadleigh, he went with his wife for a holiday to Paris, where they saw the aftermath of the Commune. While Mr. McAll was addressing a street gathering in the Rue de Belleville, a workman spoke out from the crowd: "If any one will come among us teaching a religion, not of hierarchy and superstition, but of reality and earnestness and liberty, very many of us are ready to listen." The McAlls accepted the invitation, and six months afterward (January, 1872) they opened the Mission Populaire Evangélique de France in a small room in the Rue Julien Lacroix, Belleville, the locality in which the priests had been murdered during the Reign of Terror. The rest of his life Mr. McAll devoted to the interests of the mission. For his success in promoting public morality and education in France he was decorated with the cross of the Legion of Honor in 1892. He was an accomplished musician and with his wife prepared a French Protestant hymn book. See McALL MISSION.

McAL′LISTER, ADDAMS STRATTON (1875–). An American electrical engineer and editor, born at Covington, Va. He was educated at Pennsylvania State College (B.S., 1898; E.E., 1900), where he became a professorial lecturer in 1909, and at Cornell University (M.M.E., 1901; Ph.D., 1905), where he was an assistant in physics in 1901, instructor in 1902–03, and acting assistant professor of electrical engineering in 1903–04. He was employed by the Berwind-White Coal Mining Company in 1898, and by the Westinghouse Electric and Manufacturing Company in 1899. He served as associate editor in 1905–12 and thereafter as editor of the *Electrical World*. In 1915 he was president of the Illuminating Engineering Society. Besides many special articles, he is author of *Alternating Current Motors* (1906; 3d ed., 1909) and *Standard Handbook for Electrical Engineers* (1907).

McAL′LISTER, FORT. See FORT McALLISTER.

McALLISTER, WARD (c.1830–95). An American society leader. He was born in Savannah, Ga., where his family had long been prominent in legal circles, and in 1850 accompanied his father to California. Two years later he returned to the East and made his home at Newport and later in New York City. Through his mother and his wife he was connected with many prominent Eastern families, and, as he had by his marriage gained a comfortable fortune, he devoted himself to social life. In this he succeeded so well that in time he became the most conspicuous leader of New York society. He was a famous gourmet and a delightful storyteller, but would probably never have become known outside of his own limited circle had it not been for his chance remark that New York's "smart" society comprised only 400 persons. This saying was widely copied in the newspapers and was the origin of the term "The Four Hundred." His contributions to the press and his book, *Society as I Have Found it* (1890), did much to undermine his social influence.

McALL (mak-ạl′) **MISSION.** An undenominational Protestant organization for religious work among the laboring people of France, where it is known as the Mission Populaire Evangélique de France. It was founded in 1872 by the Rev. R. W. McAll (q.v.) and his wife, with the full sympathy of the pastors of the Protestant churches of Paris. The first station was opened in January, 1872, in Belleville, one of the artisan districts of Paris. The work grew rapidly, spreading through France and into Corsica, Algeria, and Tunis. No attempt is made to found churches; the meetings are held in halls. Converts are directed to seek membership in the nearest church of their choice, the pastors of these churches giving much aid in the work of the halls. Its stations in 1914 numbered 13 halls in Paris and environs and 29 halls situated in the following localities: Amiens, Béthune, Creil, Calais, Desvres, Fives-Lille, Grasse, Lagny, La Rochelle, Limoges, Louches, Marseilles, Nantes, Nemours, Nice, Rochefort, Saint-Etienne, Saint-Quentin, Saint-Yrieix, Rouen, and the following localities in Corsica: Ajaccio, Aullène, Cuttoli, Monaccia. A variety of work is conducted in these halls, such as evangelistic meetings, children's meetings and schools, gospel temperance, mothers' meetings, Young Men's and Young Women's Christian Association work, Christian Endeavor work, meetings for the blind, Bible classes, dispensaries, etc. Two mission boats, *Le Bon Messager* and *La Bonne Nouvelle*, are at work on the rivers and canals, and a motor car is used for itinerant work. Nearly 25,000 meetings of all kinds were held by the mission workers during the year 1912–13.

Over fifty thousand dollars annually are contributed to maintain the work. This fund comes from France, Switzerland, Great Britain and other European countries, and from Canada and the United States. The American McAll Association was founded in 1883 in Philadelphia for the purpose of collecting and forwarding funds for the support of the mission, and it contributes nearly one-half the support of the work. It now embraces over 60 auxiliaries in different cities. Canada and the Channel Isles also have auxiliaries.

MACALLUM, ma-kăl′ŭm, ARCHIBALD BYRON (1859–). A Canadian educator and physiologist, born at Belmont, Ontario, and educated at Toronto and Johns Hopkins universities. He was lecturer on physiology (1887) and professor (1891–92) in the medical faculty of Toronto University; associate professor (1892–1901), and after 1901 professor, in the arts faculty. He served as president of the Canadian Institute (1895–97), became a fellow of the Royal Society of Canada (1901) and of the Royal Society, London (1906), and was elected president of the American Society of Biochemists (1911). His scientific papers appeared in the *Proceedings of the Royal Society, Journal of Physiology, Quarterly Journal of Microscopical Science, American Journal of Morphology,* and *Journal of Anatomy and Physiology.*

McALPINE, mak-ăl′pĭn, WILLIAM JARVIS (1812–90). An American civil engineer, who, during a professional career of more than 60 years, was connected with some of the most important canal, dock, bridge, railway, and municipal water-works construction of his time, besides filling various major executive official positions. His father, John McAlpine, was a mechanical engineer who built many mills in New York, Pennsylvania, and New Jersey. William, born in New York City, April 30, 1812, was sent to the school of the Rev. Luther Halsey at Newburgh, where more than usual attention was given to the rudiments of engineering, and later, to gain a knowledge of the classics, he attended Newburgh Academy and a boarding school at Rome, N. Y. At 15 he began his engineering career as a rodman on canal work at Carbondale, Pa., under the noted hydraulic engineer, John B. Jervis (q.v.). After a series of engagements on canal, river, and railway work, he was engineer in charge of surveys and works on the enlargement of the Erie Canal from 1835 to 1845, being chief engineer of the eastern division in 1839. From this time on he maintained a reputation as an authority on the design and construction of earth dams and embankments. Becoming connected in 1845 with the construction of the great stone dock of the Brooklyn Navy Yard, from 1846 to 1849 he was in charge of that work, with the title of Engineer of the United States Bureau of Yards and Docks. In 1850 McAlpine entered upon a career of 40 years as designing and consulting engineer for water works, at a time when not 100 cities in the United States had public water supplies. In that year he reported on an improved water supply for Albany and in 1851 on a new supply for Chicago, each of which was immediately carried out under his direction, superseding or supplementing private works which were bought by the cities. Among his many other water-supply engagements mention may be made of Brooklyn, 1851; Montreal, 1869; Philadelphia, 1875; New York City, additional Croton supply, 1882 and later. He was State engineer of New York (1852–54); a railroad commissioner of the same State (1854–56); then became engineer and in 1858 vice president of the Erie Railroad; was engineer and vice president of the Galena and Chicago Railroad (1857); chief engineer of the Third Avenue Bridge over the Harlem River, New York City (1860–61); chief engineer and vice president of the Ohio and Mississippi Railroad (1861–63); and engineer in chief of a Pacific railway project (1864–65). Thereafter to his death, which took place at New Brighton, Staten Island, Feb. 16, 1890, he was engaged chiefly in consulting practice and largely on the water works already mentioned. A notable foreign engagement was his appointment by the Austrian government as one of a commission to report on the rectification of the Danube above and below the famous Iron Gate (q.v.). For his share in this work he received much credit. He was a member of important engineering societies, both in the United States and in foreign countries. Besides filling a long series of notebooks with valuable details of his professional observations and experiences, McAlpine contributed many papers to the proceedings of the American Society of Civil Engineers and the Institution of Civil Engineers. For one of the latter, "The Supporting Power of Piles," he was awarded the Telford (q.v.) gold medal.

Mc′ANE′NY, GEORGE (1869–). An American civic administrator, born at Greenville, N. J. He graduated from the Jersey City High School and studied law. He engaged in newspaper work in New York City from 1885 to 1892, was assistant secretary (1892–94) and secretary (1894–1903) of the Civil Service Reform League, served on committees that drafted the municipal home-rule section of the State constitution in 1894 and the State civil-service law of 1899, and was a member of the New York Civil Service Commission in 1902 and also of the commission to revise the city charter in 1908. He served as president of the City Club, New York, in 1906–09, and, engaging in the fight against Tammany Hall, was president of the Borough of Manhattan in 1910–13. In this office he rendered notable service, particularly by his campaign to clear the public sidewalks of encroachments. He was elected on a fusion ticket as president of the board of aldermen of New York City for the term 1914–17 and was active in obtaining municipal markets for New York City. In 1913 he had been a prominent fusion candidate for the mayoralty nomination. He married a daughter of Abraham and Mary Putnam Jacobi (qq.v.). His Dodge lectures at Yale were published as *Municipal Citizenship* (1915).

MACAO, mä-kou′ (Chin. *Ngao-mun;* probably derived from *A-ma-ngao,* the bight or inlet of the goddess Ama). A Portuguese settlement near the western entrance to the Canton River, China, 40 miles west of the British colony of Hongkong; lat. 22° 11′ N., long. 113° 33′ E. (Map: China, K 7). It occupies a small peninsula, formerly an island, but now connected by a narrow spit or neck of land, formed by the action of the tides, with the island and prefecture of Hiang-shan, on the north; area, 4.6 square miles; pop., Dec. 31, 1910, 74,866, which includes 3919 whites (3780 Portuguese) and 60,057 Chinese.

The town is built on an irregular table-land, which occupies the central and narrower part of the peninsula and connects several rugged, rapidly disintegrating granite hills from 200 to 500 feet high on the south, with a few somewhat lower hills on the north, where the land slopes away into an alluvial plain about half a mile wide. Still farther north this rapidly narrows into the spit of land already mentioned, across which a barrier was erected by the Chinese in 1573. The place is defended by numerous little-needed forts erected in the seventeenth and eighteenth centuries. Within the walls of one of them—Fort Guia—was erected in 1865 the first lighthouse on the China coast. It has a tower 333 feet above the sea.

Macao possesses a cathedral, many churches, a theatre, several hospitals, and charitable institutions, but no buildings of special importance or architectural beauty, the most striking object being the façade of the ancient Collegiate Church erected by the Jesuits in 1594, converted into barracks on the expulsion of the Jesuits in 1759, and almost totally destroyed by fire in 1835.

Macao is well situated for trade and flourished until the opening of Hongkong as a free port; but the increasing shallowness of its inner harbor (formed on the west by the large island of Patera), and the exposed position of the equally shallow roadstead on the east, unfit it for a great seaport, modern vessels having to lie off shore from 3 to 6 miles. The Portuguese government is now attempting to improve the harbor by annual appropriations, which began in 1909. Trade is chiefly in transit with Hongkong and Canton and is for the most part in the hands of the Chinese and Parsis. In 1910 the imports were valued at 7,392,040 escudos and exports at 6,707,360 escudos, while for 1910–11 the revenue was estimated at 636,450 escudos and the expenditures at the same amount (gold escudo = $1.08; paper, $0.94). The military is composed of 488 men, including 164 natives. The city is composed of two wards, one Chinese and the other non-Chinese. Each has its own administrator. The climate of Macao is delightful, and many Europeans from Hongkong and other southern ports are attracted here during the summer. The mean temperature is 74° F., and the annual rainfall about 67 inches, chiefly in July and August.

The Portuguese first settled here in 1577, when certain merchants who had squatted on the island of Lampaco, and who had assisted the Chinese authorities in dealing with pirates, were permitted to move hither to erect warehouses. Though Portugal sent out a royal governor in 1628, Macao continued to be regarded by the Chinese as Chinese territory until 1887, when by treaty China relinquished her claim on condition that the land should never be alienated without China's consent. It is now, therefore, governed wholly as a Portuguese colony, and forms a province together with the two neighboring islands of Taipa and Colowan. All through the stormy days of early foreign relations with China, Macao was a place of safe retreat for both the merchant and the missionary. Here Wells Williams set up his printing press in 1844, and here in the old Protestant Cemetery are the graves of many British and Americans who died at Macao, among them Robert Morrison, the first Protestant missionary to China. Camões, the Portuguese poet, spent 18 months of exile here, and on one of the hills is pointed out the grotto in which it is said he composed part of the *Lusiad.* Macao is notorious for its gambling houses, the tax on which provides most of the public revenue, and for its share in the infamous coolie traffic which came to an end only in 1873. Consult Thomson, *The Chinese* (Indianapolis, 1909). See SOYESHIMA.

MACAO. See VINGT ET UN.

MACAPÁ, mä-kå-pä′. A town in Brazil, situated on the equator, on the north shore of the Amazon delta, 110 miles from its mouth (Map: Brazil, G 3). It is a fortified town with an excellent harbor and has a good export trade in timber and cabinet woods. Pop., 4000.

MACAQUE, må-kåk′ (Fr. *macaque,* from *macaco, macaquo,* the native name). An Asiatic monkey of the genus *Macacus,* or *Pithecus,* of the family Cercopithecidæ (q.v.), or Lasiopygidæ. These monkeys are of moderate size, the males always decidedly larger than the females and with stronger canine teeth; they have cheek pouches and large ischial callosities; and the tail is usually short. Many of the monkeys seen in menageries are macaques. When young, they are docile and active, but as they grow old they become morose and exhibit some of the ferocity of their cousins the baboons. They are naturally forest-dwelling animals, and go about in troops which comprise individuals of both sexes and of all ages. These troops do not mix with other monkeys, and the voices and gestures of all the macaques differ markedly from those of the langurs and other Oriental monkeys. Their diet is varied and includes, besides the ordinary insects, fruits, and succulent leaves, lizards, frogs, and crustaceans. One of the most widely known, called by the Malays kra (*Macacus cynomologus,* or *Pithecus irus*), feeds mainly on crabs caught along the seashore. More familiar is the bonnet monkey (*Macacus sinicus*), which takes its name from a quaint crest of upright hair on the crown and is numerous all over southern India, where it makes itself a nuisance by pillaging the provision shops. A closely related species, the rilawa (*Macacus pilcatus*), is a favorite pet and trick monkey in Ceylon. Various other species are scattered through the Orient, of which the lion-tailed and rhesus monkeys are elsewhere described; the pig-tailed (*Macacus leoninus,* or *andamanensis*) is notable for its size and short piglike tail; and the Japanese species (*Macacus* *fuscatus*), whose tail is thickly haired, is the monkey so constantly represented in Japanese art. The most interesting of all the macaques, however, is the single species making its home west of India—the magot, or Barbary ape, now placed in a genus by itself, *Simia sylvanus.*

Barbary Ape. This is the ape of the Rock of Gibraltar and the opposite coast of Africa and hence remarkable as the only monkey living wild in Europe. Whether it was indigenous on the European side of the strait, or was taken there by human agency in some past time, cannot now be determined, but these apes are frequently imported from the mountains of Algeria and Morocco, where they are a great pest to the Arab rustics, whose orchards and vegetable gardens they plunder; when this resource fails, they live upon pine nuts, chestnuts, and the like. Their habits are similar on Gibraltar, where a score or more are carefully protected as a public curiosity. This ape is undoubtedly the "pithecus" of Aristotle and other ancient writers, and it was the animal which the Greek and other ancient physicians dissected in order to obtain information in regard to human anatomy.

Fossil remains of macaques occur in the Pliocene rocks of Europe, and there is evidence that apes of this genus inhabited Great Britain in the Pleistocene period. See MONKEY, and Plate of MONKEYS OF THE OLD WORLD.

MACA'REUS. See CANACE.

MAC'ARO'NI (It. *maccheroni*, OIt. *maccaroni*, from *maccare*, Lat. *macerare*, to macerate). Wheat paste, usually in the form of tubes or threads, varying in diameter; formerly a distinctive product of Italy, but now made in France, the United States, and other countries. It has long been made in China. Wheat containing a large percentage of gluten is required. Within recent years the cultivation of durum or macaroni wheat has assumed considerable importance in the United States and large amounts are raised in the Northwest in localities where other wheats do not thrive. The wheat is ground into a coarse meal, from which the bran is removed. It is then called *semola* or *semolina*, is worked into a dough with hot water, and placed in a vertical cylinder of brass, 8 or 9 inches in diameter, the bottom of which is perforated with holes of the size desired. In making vermicelli and all kinds of solid macaroni the holes are very small; but in making the tube macaroni the holes are larger and have a conical blade inserted to form the tube. The dough is squeezed out of the cylinder through these holes by hydraulic pressure and cut off in lengths of about 3 feet. These are dried in the sun and are ready for shipment.

The laborious hand process of making macaroni formerly employed has been given up. The manufacture of macaroni is of great importance to Italy, where it forms a large article of home consumption and from which country it is exported to all parts of the world. Macaroni uncooked has the following composition: water, 10.3; protein, 13.4; fat, 0.9; carbohydrates, 74.1; ash, 1.3 per cent; the fuel value being 1665 calories per pound. When cooked water is taken up, and it resembles bread more closely in composition. It has much the same digestibility and serves the same purpose in the diet as bread. It is cooked in a great variety of ways, often with tomato or cheese or other materials which add flavor or nutritive material or both. Macaroni and the many similar goods are together known as "Italian pastes." The use of macaroni in the United States has greatly increased, the importation having grown from 40,224,000 pounds in 1904 to 126,129,000 in 1914.

MACARONI CLUB. A club of London exquisites in the latter part of the eighteenth century, said to have taken their name from their favorite dish. They were noticeable on account of their fantastic costume, which included an eccentric style of hairdressing, a small hat, short coat, tight silk breeches, and a tasseled stick.

MAC'ARON'IC VERSE (It. *maccheronico*, relating to macaroni, from *maccheroni*, macaroni). Properly, a kind of humorous poetry in which, along with Latin, words of other languages are introduced with Latin inflections and constructions; but the name is sometimes applied to verses which are merely a mixture of Latin and the unadulterated vernacular of the author. Teofilo Folengo, called Merlino Coccajo (q.v.), a learned and witty Benedictine, who was born at Mantua in 1491 and died in 1544, has been regarded as the inventor of macaronic poetry, but erroneously, for a *Carmen Macaronicum de Patavinis* was published by Tisi degli Odassi in 1490. Folengo, however, was the first to write macaronic verse with distinguished success. The term was selected with reference to the mixture of ingredients in the dish called macaroni. His *Maccaronea* or *Macaronica* (published in 1521; many later editions) is a long satiric poem, in which Latin and Italian are mingled. This work deeply influenced Rabelais' *Voyage of Pantagruel.* A French writer named Antoine de la Sablé, but who called himself Antonius de Arena, also wrote macaronic verse with special success; he died in 1544. Fortunately, macaronic poetry has not been very extensively cultivated, although specimens of it may be found in the literature of almost all European countries. The idea of it was probably first suggested by the barbarous monkish Latin. There is a history of macaronic poetry, and a collection of the principal works of this kind by Genthe, *Geschichte der maccaronischen Poesie* (Halle, 1829).

Bibliography. William Sandys, *Specimens of Macaronic Poetry* (London, 1837); J. O. Delepierre, *Macaronéana: ou, Mélanges de littérature macaronique des différentes peuples de l'Europe* (Brighton, Eng., 1852); id., *De la littérature macaronique et de quelques raretés bibliographiques de ce genre* (2 vols., London, 1855–56); id., *Macaroneana: overum, nouveau mélanges de littérature macaronique* (ib., 1862); J. A. Morgan (ed.), *Macaronic Poetry* (New York, 1872); J. C. Brunet, *Littérature macaronique* (Paris, 1879).

MAC'AROON' (Fr. *macaron*, from OIt. *maccaroni*, macaroni). A favorite kind of small cake or biscuit, made with ground sweet almonds, or almond meal, instead of wheat or other flour. The almond meal dry, or, what is still better, almonds just blanched and beaten into a paste, is thoroughly mixed with fine sugar and the whites of eggs, the paste dropped on an oiled paper or tin, and then baked until a delicate brown. Similarly macaroons are made from cocoanut.

MacAR'THUR, ARTHUR (1845–1912). An American soldier, born in Springfield, Mass. He began service in the Civil War as first lieutenant in the Twenty-fourth Wisconsin Infantry, in August, 1862, participated in the battles of

Perryville, Stone River, and Chattanooga, and in the Atlanta campaign, was made a lieutenant colonel of volunteers, and was mustered out in 1865. For gallant conduct at the battle of Missionary Ridge (1863) he was in 1890 awarded the congressional medal of honor. In February, 1866, he entered the regular army as first lieutenant, and in July, 1889, he became assistant adjutant general, with the rank of major. He was appointed brigadier general of volunteers in May, 1898, shortly after the outbreak of the Spanish-American War (q.v.), and major general of volunteers in August of the same year, and in 1898–99 was on special duty in Havana, Cuba. In 1899 he was sent to the Philippine Islands, and in 1900 succeeded General Otis as commander of the Division of the Philippines and military Governor of the islands. In January, 1900, he became a brigadier general in the regular army, and in February, 1901, major general. In 1906 he was made assistant chief of staff and lieutenant general. Upon his return to the United States he was placed in command successively of the departments of Colorado (1901–02), the Lakes (1902), the East (1902), the Lakes (1902–03), California (1903), and the Pacific Division (1904–07). He was retired by the operation of law June 2, 1909.

McARTHUR, Duncan (1772–1839). An American soldier. He was born in Dutchess Co., N. Y., and, his family having removed to Pennsylvania in 1780, he served as a volunteer in Harmar's campaign against the Miami Indians and in later campaigns on the frontier. He removed to Ohio shortly after this and established himself as a surveyor near Chillicothe, in which vicinity he acquired large tracts of land that subsequently became very valuable. In 1805 he was elected a member of the Legislature of Ohio. He entered the War of 1812 as colonel of an Ohio volunteer regiment, was promoted to a brigadier generalship in 1813, and the next year succeeded General Harrison as commander of the Army of the West. He was a member of the State Legislature in 1815–21, a member of Congress in 1823–25, and in 1831–33 was Governor of Ohio.

MacARTHUR, Robert Stuart (1841–). An American Baptist clergyman. He was born at Dalesville, Quebec, Canada; graduated at the University of Rochester in 1867, and at Rochester Theological Seminary in 1870, and thereafter until 1911 was pastor of Calvary Baptist Church, in New York City. He held also a pastorate at Atlanta, Ga., but resigned in 1913. For a considerable period he was one of the editors of the *Christian Inquirer* and of the *Baptist Quarterly Review.* He participated in the preparation of *The Calvary Selection of Spiritual Songs, Laudes Domini,* and *The Calvary Hymnal.* His publications also include: *The Attractive Christ and Other Sermons* (1898); *Celestial Lamp* (1899); *Old Book and Old Faith* (1899); *The Question of the Centuries and Other Sermons* (1905); *Advent, Christmas, Easter, and Other Sermons* (1907); *The Christic Reign* (1908); *Royal Messages of Cheer and Comfort* (1909); *The True Scala Santa* (1910); *A Foundation Builder* (1911).

MacARTHUR-FORREST PROCESS. See section on *Metallurgy* under Gold.

MACART'NEY, George, Earl Macartney (1737–1806). A British diplomat. He was born at Lissanoure, near Belfast, Ireland; graduated at Trinity College, Dublin, 1757; studied law in London; then made the tour of Europe, and on his return in 1764 was appointed Envoy Extraordinary to the Empress of Russia, to conclude a commercial treaty with that country. Returning in 1767, he sat for a time in the British Parliament, and from 1769 to 1772 was Chief Secretary for Ireland. Appointed Governor of the island of Grenada in 1775, he was taken prisoner on the capture of that island by the French in 1779, but was soon released by Louis XVI and allowed to return to England. In 1776 he was raised to the Irish peerage with the title of Baron Macartney. From 1780 to 1786 he was Governor of Madras. In 1788 he took his seat for the first time in the Irish House of Peers; in 1792 was made an Irish viscount, and went as Ambassador Extraordinary to Peking, the first British Envoy sent to China. In 1794 he was made Earl Macartney in the Irish peerage, and returned from China. In 1796 he was made a British peer with the title of Baron Macartney, and at the end of that year was appointed Governor of the newly captured territory at the Cape of Good Hope. In 1798 he resigned on account of declining health, and for the same cause declined the offer of a seat in the Cabinet of the Addington ministry in 1801. He died at Chiswick. Consult Sir George Staunton, *Macartney's Embassy to China* (London, 1797), and John Barrow, *Life and Writings of Lord Macartney* (ib., 1807).

MACARTNEY COCK, or Fire-Backed Pheasant. See Pheasant.

MACAS'SAR. The capital and chief commercial seaport of Celebes, Dutch East Indies, situated on the east coast of the island, in lat. 5° 20′ S. and long. 119° 28′ E. (Map: East Indies, E 7). It is well built and is fortified by palisades and two forts. It exports rice, coffee, rubber, coconut oil, mother-of-pearl, trepang, timber, etc. The Governor of Celebes and its dependencies resides at Vlaardingen, which is the name of the European quarter of the town. Pop., 1905, 17,925, including 941 Europeans.

MACASSAR OIL. A fixed nondrying vegetable oil obtained from the fruit of the *Stadtmannia sideroxylon* or *Schleichera trijuga* and named from the district of Macassar, in the island of Celebes, where it is produced. The plant yields about 70 per cent of oil, which is used exclusively in pharmacy. The name, however, has been given to a pomade made from almond, olive, or peanut oil, to which other substances are added to give color and perfume.

MACAS'SARS, or MANGKAS'SARS. A Malayan people, occupying that portion of southern Celebes known as Macassar. In 1875 the number speaking Macassar was estimated at 320,000, and those using the closely related Buginese at 680,000, but these figures are too high. The Macassars are described as of milder habits, greater commercial ability and literary culture than many of the kindred tribes. Physically they are nevertheless of the same type as the ruder pagan Toradja population of central Celebes (Sarasin). Consult: Lahure, *L'Ile Célèbes* (Brussels, 1880); Van Staden ten Brink, *Zuid-Celebes* (Utrecht, 1884); Riedel, *De sluiken kroesharige rassen tusschen Selebes en Papua* (The Hague, 1886); Meyer, *Album von Celebes-Typen* (Dresden, 1889); Fritz Sarasin, *Versuch einer Anthropologie der Insel Celebes,* vol. ii (Wiesbaden, 1906).

MACASSAR STRAIT. A body of water which separates the islands of Borneo and Celebes and unites the Java Sea with the Sea of Celebes (Map: East Indies, E 5 and 6). It varies in width from 75 to 140 miles, is about 400 miles long, and contains several island groups. Owing to the numerous shoals and the strong south current during January and February, its navigation is very difficult.

MACATÓ, mä'kȧ-tō'. A town of Panay, Philippines, in the Province of Cápiz. It is situated on the main road, near the coast, and 30 miles west-northwest of Cápiz. Pop., 1903, 5289.

MACAULAY, m*a*-kạ'lĭ, CATHARINE (SAWBRIDGE) (1731–91). An English historian, the wife first of George Macaulay, M.D., and after his death (1766) of William Graham, and generally referred to as Catharine Macaulay Graham. She is chiefly known for *The History of England, from the Accession of James I to that of the Brunswick Line* (8 vols., 1763–83), once extremely popular and lauded by Pitt before the House of Commons, but characterized by Lord Macaulay as "more distinguished by zeal than either by candor or skill," and now unread. A pronounced republican, she made Franklin's acquaintance at Paris, and was a friend of Washington, whom she visited in America in 1785.

MACAULAY, GEORGE CAMPBELL (1852–1915). An English scholar, educated at Eton and at Trinity College, Cambridge, where he graduated in 1876 and of which he became fellow two years later. From 1878 to 1887 he was assistant master of Rugby School, from 1901 to 1905 professor of English language and literature at the University College of Wales, Aberystwyth, and after 1905 lecturer in English at Cambridge. Macaulay is to be counted a literary explorer and discoverer. In 1895 he proved beyond doubt that an old manuscript he found in the Cambridge University Library was Gower's "Speculum Meditantis," for centuries supposed lost. (See GOWER, JOHN.) He edited the English department of the *Modern Language Review;* published: *Francis Beaumont, a Critical Study* (1883); an edition in four volumes of *The Works of John Gower* (1899–1902); *James Thomson*, in the "English Men of Letters Series" (1908); and contributed to the *Cambridge History of English Literature* (1907 et seq.).

MACAULAY, SIR JAMES BUCHAN (1793–1859). A Canadian jurist, born at Niagara. He entered the British army and during the War of 1812 fought at Ogdensburg, Oswego, and Fort Erie. He was afterward admitted to the bar, became an executive councilor, and in 1829 a judge of the Queen's Bench Court. In 1849 he became the Chief Justice of the newly constituted Court of Common Pleas, resigning in 1856. For a short time previous to his death he was judge of the Court of Error and Appeal. The commission for the consolidation of the statutes of Upper Canada owed the final completion of its task in 1858 largely to his efforts as chairman. He was knighted in 1859.

MACAULAY, THOMAS BABINGTON, LORD MACAULAY (1800–59). An eminent English historian and statesman. He was born at Rothley Temple, Leicestershire, Oct. 25, 1800, being the eldest son of Zachary Macaulay. As a child, he was most precocious, reading voluminously from the age of three, writing a universal history at seven, and composing treatises, poems, ballads, and hymns at 10. At 12, after a childhood influenced beneficially by the judicious counsel of Hannah More, he was sent in 1812 to the private school of a Mr. Preston. During the years spent there he advanced with the rapidity of which his earliest days had given such ample promise, and in 1818 entered Trinity College, Cambridge, where he acquired a brilliant reputation both as a scholar and a debater. Twice he won first honors in the English prize-poem contest—in 1819 by a poem on "Pompeii" and in 1820 by another on "Evening"—but was debarred by his distaste for mathematics from securing the much-coveted chancellor's medal. In 1821 he obtained the second Craven scholarship, in 1822 took the bachelor's degree, and in 1824, after two unsuccessful trials, was elected a fellow of Trinity and began to devote himself zealously to literature. The first medium of his writings was *Knight's Quarterly Magazine*, circulating chiefly among the students at Eton and Cambridge. For this he wrote several of his earliest ballads—e.g., *The Spanish Armada, Moncontour, The Battle of Ivry*—and numerous essays and critiques. In 1825 he took the master's degree and in the same year made his appearance in the columns of the *Edinburgh Review* with his famous essay on Milton. The learning, eloquence, brilliancy, and generous enthusiasm of this attracted the instant attention of the educated public and opened to the young author the highest social privileges. Into the enjoyment of these new-found honors he was just beginning to enter when the culmination of family financial misfortunes brought him temporarily to almost abject poverty. In 1826 he was called to the bar at Lincoln's Inn; but two years' pretense at practice left him unadvanced in the profession, for he had a greater penchant (encouraged by the circumstances of his early home training) for politics than for the courts. In 1830 the friendship of Lord Lansdowne, holder of the "pocket borough" of Calne, opportunely opened the way for his entrance into the political world at one of its most critical moments. Once in Parliament, he threw himself with characteristic earnestness into the reform movement, becoming one of the leading members of the rising Whig party through his splendid eloquence and effective argument. On the victory of his party in 1832 he was made one of the Board of Control of Indian Affairs. In 1834 reappearing financial necessity compelled him somewhat reluctantly to leave England and enter the active India service as a member of the Supreme Council. During the four years thus spent his ability found expression in the creation of a new and humane penal code and in continued literary labors. Returning to England in 1838, he resumed his political career, being in 1839 elected a member of Parliament for the city of Edinburgh. Accepting later in the same year an appointment to the post of Secretary of State for War in Melbourne's ministry, he shared its fall in 1841. In 1842 appeared his magnificent martial ballads, *Lays of Ancient Rome*, and in 1843 three volumes of *Essays*. Having devoted five years to combined literary work and powerful aid to the Whig opposition, he was, on the return of his party to power in 1846, restored to office, this time as Paymaster-General. The loss of his seat in Parliament, however, incurred in 1847 through his too zealous advocacy of religious toleration at an unpopular moment, offered him at length an opportunity for devoting himself seriously to the work for which he had been planning during several years—his great *History of England from the Accession of James II.* The first two volumes of the work appeared in 1848 and achieved at once such an extensive and enduring success as had hitherto been the lot of the most popular novelists alone. The year following their appearance he was elected lord rector of the University of Glasgow, and was offered a position again in the cabinet under Lord Russell, which latter honor, however, he declined. In 1855 Edinburgh made such reparation for its slight of 1847 as it could, by returning him unsolicited to his former seat in Parliament. Declining an offer of the professorship of modern history at Cambridge, he devoted himself more assiduously to the writing of his *History*. The appearance of the third and fourth volumes in 1855 created a furor of excitement among publishers and readers. In the United States their sale exceeded that of almost every other book except the Bible. In 1857 the French Academy of Moral and Political Science made him a foreign associate, and in the course of the same year he was raised to the peerage of Great Britain under the title of Baron Macaulay of Rothley. But ill health, interrupting his work as early as 1852, had by 1857 made serious inroads upon his physical strength. He died rather suddenly on Dec. 28, 1859, at Holly Lodge, a quiet retreat to which he had retired in 1857. He was buried in Westminster Abbey, in Poets' Corner. His premature death left uncompleted his great *History*, which extended only through the period of William III when its author's work ended.

Macaulay was indisputably a man of splendid talent. His scholarship—in the strictly classical sense of the term—was admirable; his miscellaneous literary acquisitions were something prodigious; his knowledge of modern European, and especially of English, history from the age of Henry VIII down to his own, was unsurpassed. His *History* will always be read on account of its wonderful style, and although it suffers from the author's passion for epigram at the expense of truth, and from his partiality and frequent exaggeration, yet the loss from these defects has been habitually exaggerated by the dry-as-dust scientific historians.

Bibliography. The only complete edition of Macaulay's works is that published by his sister, Lady Trevelyan (London, 1866); the chief authority on his life is Trevelyan, *Life and Letters of Lord Macaulay* (ib., 1876; enlarged and complete ed., 2 vols., New York, 1909). Consult also: Frederick Arnold, *The Public Life of Lord Macaulay* (London, 1862); Peter Anton, *Masters in History* (Edinburgh, 1880); J. A. C. Morison, *Macaulay* (London, 1882), in the "English Men of Letters Series"; A. S. G. Canning, *Lord Macaulay, Essayist and Historian* (ib., 1882; new ed., 1913); John Morley, *Critical Miscellanies* (ib., 1888); G. E. Saintsbury, "Macaulay," in his *Corrected Impressions: Essays on Victorian Writers* (New York, 1895); D. A. Hughes, *Thomas Babington Macaulay, the Rhetorician: An Examination of his Structural Devices in the History of England* (Ithaca, N. Y., 1898); J. B. McMaster, "Thomas Babington Macaulay, 1800–1859," in *Warner Classics*, vol. iv (New York, 1899); D. H. Macgregor, *Lord Macaulay* (London, 1901).

MACAULEY, CATHARINE (1787–1841). An Irish philanthropist. Adopted by a wealthy family, she received a considerable fortune, with which in 1827 she founded the House of Our Blessed Lady of Mercy, devoted to the care of the sick. She later became superior of the Order of the Sisters of Mercy, to which the Dublin institution gave rise, and which spread through Europe and America.

McAULEY, m'kạ'lĭ, "JERRY," or JEREMIAH (1839–84). A lay mission worker. He was born in Ireland, came when a boy of 13 to New York, and grew up as a criminal. On a false charge of highway robbery he was sent to Sing Sing prison (1857), but he was pardoned (1864) and relapsed into evil ways. In 1872 he was converted and from then till his death (Sept. 18, 1884) he spent his energies in successful efforts to convert others and by choice those who had sunk to the lower levels of degradation. The first scene of his labors was in Water Street, New York City, but in 1882 he opened the mission on West Thirty-second Street which now bears his name, the Jerry McAuley Cremorne Mission. Consult his *Life* by P. M. Offord (7th ed., New York, 1907).

MACAW, ma-kạ′ (Brazilian *macao*). One of the large strong-flying and gaudy South American parrots of the subfamily Conurinæ, known locally as araras. They are distinguished by the very long wedge-shaped tail, long and pointed wings, large strong feet, naked cheeks, and short, very strong, highly arched bill. They do not readily learn to articulate words, but are easily domesticated, and become much attached to those with whom they are well acquainted. Their natural notes are hoarse and piercing screams; and as they cannot be taught not to scream, they are often unpleasant captives. They are less gregarious than other parrots and almost never seen in flocks, but usually in pairs, flying and feeding close together. They lay their eggs, generally two, in the hollows of decayed trees; feed chiefly on fruits and seeds; and often commit great depredations on fields of maize. In domestication, macaws readily eat bread, sugar, etc. The great scarlet macaw (*Ara macao*) is sometimes more than 3 feet in length, including the long tail. The red and yellow green-winged macaw (*Ara chloroptera*) and the green macaw (*Ara nobilis*) are rather smaller. These are among the best known of a large number of species. Cf. PARRAKEET. See Plate of COCKATOOS AND MACAWS.

MACAW TREE (*Acrocomia sclerocarpa*). A palm of the same tribe with the coconut, a native of tropical and subtropical America, called macoya in Guiana, macahuba in Brazil, and gru gru in Jamaica. It is from 20 to 30 feet high, with pinnated leaves from 10 to 15 feet long. The fruit yields a sweetish light-colored, violet-scented oil, of the consistence of butter, used where the tree is indigenous as an emollient in painful affections of the joints and in rheumatism. It is largely exported as palm oil, for use in the manufacture of toilet soaps. The leaves yield a fibre characterized by its remarkable fineness and softness. The tree is cultivated to some extent as an ornamental in southern California.

MACAYA. See AVEZAC-MACAYA.

MAÇAYO, mä′sī-yō′. A city of Brazil. See MACEIÓ.

MACBETH, mak-bĕth′ (?–1057). A king of Scotland. From his father, Finlay, he inherited the rule of the Province of Moray. In the year 1040 he revolted against King Duncan of Scotland and killed him at Dunsinane. Macbeth now ascended the throne and reigned for about 17 years. He made grants to the Culdees of Lochleven, and in the year 1050 went on a pilgrimage to Rome. Malcolm MacDuncan, or Canmore, the eldest son of King Duncan, had fled to England on his father's death; and in the summer of 1054 his kinsman, Siward, Earl of Northumberland, led an English army into Scotland against Macbeth. The King was defeated with great slaughter, but escaped from the field and still kept the throne. Three years afterward he was defeated by Malcolm MacDuncan and slain at Lumphanan, on Aug. 15, 1057. Macbeth left a nephew, Luloch, who was slain in 1058 at Essie in Strathbogie. Consult: Robertson, *Scotland under her Early Kings* (2 vols., Edinburgh, 1862); Skene, *Celtic Scotland* (3 vols., ib., 1876–80); Boswell-Stone, *Shakespeare's Holinshed* (New York, 1896); Ernest Rhys, *Celtic Britain* (3d ed., London, 1904).

MACBETH. A tragedy by Shakespeare, written probably in 1606, printed in 1623. Dr. Forman saw it acted at the Globe in 1610. The source of the plot is Holinshed's *Chronicles of Scottish History* (1577), taken from Bellenden's translation (1536) of Hector Boece's Latin *Historia Scotorum* (1526). Lady Macbeth was doubtless suggested by another passage in Holinshed, "The Murder of King Duffe," of which a metrical version is found in Wyntoun's *Chronicle of Scotland* (1400). The historical prototypes of the tragedy lived about 1040, and the actual Macbeth seems to have had as good a right to the throne as Duncan, both being grandsons of a former king. That the play was written soon after James I's accession, when a Scottish theme was appropriate, seems probable from the allusion in Macbeth's vision, "Some I see that twofold balls and treble sceptres carry"; and also when Banquo, the fabled ancestor of the Stuarts, is not made to share in the murder, as was the actual case. Macbeth is Shakespeare's shortest work, and evidently much mutilated. In 1674 it was reproduced with "amendments" by D'Avenant, and some changes taken from Middleton's *Witch*, which was originally imitated from *Macbeth*.

McBRIDE, măk-brīd′, Sir Richard (1870–). A Canadian lawyer and statesman, born at New Westminster, British Columbia, and educated at Dalhousie University. He was called to the bar in 1892, practiced his profession in Victoria, and, entering politics, was elected a Conservative member of the Provincial Legislature in 1898. He was Minister of Mines in the Provincial Ministry (1900–01); leader of the Conservative Opposition (1902–03); and in 1903 became Premier and Minister of Mines. He was a delegate to the Interprovincial Conference at Ottawa (1906) and to the Colonial Conference at London, England (1907). In 1912 he was knighted.

MACBRIDE, Thomas Huston (1848–). An American botanist. Born at Rogersville, Tenn., he graduated from Monmouth College in 1869, and studied at the University of Bonn in 1891. He was professor of mathematics and modern languages at Lenox College (1870–78) and served as assistant professor of natural sciences (1878–84) and thereafter as professor of botany at the State University of Iowa. He made contributions to *Science*, the *Popular Science Monthly*, and other journals; and is author of *Lessons in Elementary Botany for Secondary Schools* (1896) and *North American Slime Moulds* (1899).

McBUR′NEY, Charles (1845–1913). A distinguished American surgeon. Born at Roxbury, Mass., he received his early education in private schools in Boston, graduated from Harvard (A.B., 1866; A.M., 1869), and took his medical degree in 1870 at the College of Physicians and Surgeons, New York City. At this college he served as assistant demonstrator and demonstrator of anatomy (1872–89), part of this time (1878–82) being also lecturer on surgery and on anatomy of nerves; as professor of surgery (1889–92) and then, until his retirement in 1907, as professor of clinical surgery. Dr. McBurney was for many years visiting surgeon to Roosevelt and Bellevue hospitals and served as consulting surgeon to various other New York hospitals. Becoming widely known as a most skillful operative surgeon, he was made a member of many medical societies in the United States and in Europe. He took an advanced position in the differentiation of appendicitis in 1882–88 and discovered "McBurney's point," which is pathognomonic of that disease. In 1889 he published his first contribution to medical literature, "Experience with Operative Interference in Cases of Disease of the Vermiform Appendix." In addition to his work on appendicitis, which made him a worldwide authority, McBurney was a pioneer in aseptic technique—he was called in consultation when President McKinley was shot. His clinic was always crowded with enthusiastic students and physicians, for McBurney was a great teacher as well as a great surgeon.

MACCABÆUS, Judas. See Judas Maccabæus.

MACCABÆUS, Simon. See Simon Maccabæus.

McCABE, ma-kāb′, Charles Cardwell (1836–1906). An American Methodist Episcopal bishop, born at Athens, Ohio. He studied at Ohio Wesleyan University and joined the Ohio Conference of his denomination in 1860. In 1862 he enlisted as chaplain in the Federal army and joined the 122d Ohio Infantry. At the battle of Winchester he was taken prisoner and was in Libby Prison for four months. He rejoined his regiment, but soon afterward was engaged as a lecturer by the Christian Commission. Subsequently he held a pastorate at Portsmouth, Ohio. In 1866 he was appointed agent of the Centenary Fund, two years later agent of the Church Extension Society, and in 1884 corresponding secretary of the Missionary Society of the Methodist Episcopal Church. In 1896 he was elected Bishop. He was a member of the General Conferences of 1884, 1888, 1892, and 1896. Consult F. M. Bristol, *The Life of Chaplain McCabe* (New York, 1908).

McCABE, James Dabney (1842–83). An American writer. He was born in Richmond, Va., was educated at the Virginia Military Institute, began very early to write for the press, and during the Civil War employed his pen in the service of the Confederate States. His chief work is *The Life and Campaigns of Gen. R. E. Lee* (1867); and he is also the author of a *Life of Gen. T. J. Jackson* (1863), a *Memoir of Gen. A. S. Johnston* (1866), *The Great Republic* (1872), and *Pathways of the Holy Land* (1877).

McCABE, Joseph (1867–). A British rationalist. Educated at St. Francis's, Manchester, at St. Anthony's, Forest Gate, and at the University of Louvain, he became a Franciscan in 1883, was ordained a priest in 1890, taught scholastic philosophy, and in 1895 became rector of Buckingham College. In 1896 he left the

Roman Catholic church and devoted himself to lecturing and writing, mostly on rationalistic subjects. His books include: *Twelve Years in a Monastery* (1897); *Modern Rationalism* (1897); *Abelard* (1901); *St. Augustine and his Age* (1902); *Talleyrand* (1906); *The Martyrdom of Ferrer* (1909); *The Decay of the Church of Rome* (1909); *The Evolution of Mind* (1910); *The Empresses of Rome* (1911); *The Story of Evolution* (1912); *Goethe* (1912); *The Empresses of Constantinople* (1913); *A Candid History of the Jesuits* (1913); *The Sources of the Morality of the Gospels* (1914); *George Bernard Shaw* (1914); *Treitschke and the Great War* (1914); and translations from Haeckel, Ferrer, and Günther. Consult Chesterton's *Heretics* (London, 1909), which has a chapter on "Mr. McCabe and a Divine Frivolity."

MAC'CABEES. The name given to a Jewish family of great prominence (167–37 B.C.). The surname Maccabæus properly belongs only to the most prominent representative of the family, Judas, and in the Books of the Maccabees is given to him alone. From him the designation was applied to other members of the family. While the common interpretation of Maccabæus as 'the hammerer' is open to objection, and there is no proof that it was given to Judas because of valor, no more probable suggestion of the origin of the name has been made. The family are more correctly designated Asmonæans, or Hasmonæans, from the name of an ancestor. The Maccabees first come into prominence in connection with the attempt of Antiochus IV Epiphanes (175–164 B.C.), to crush out by force the rites of the Jewish religion and substitute the Greek cult therefor. (See Jews.) Every village in Palestine was required to set up an altar to the Greek gods, to which daily sacrifices were to be offered. At this juncture the aged priest Mattathias, with his five sons, Jochanan, Simon, Judah (Judas), Eleazar, and Jonathan, placed themselves in opposition to the King's policy. At the beginning of the trouble Mattathias was residing at Modin, a town about 18 miles northwest of Jerusalem. When ordered to offer the first heathen sacrifice, he resolutely refused. Apelles, a Syrian captain, endeavored to induce him by tempting promises to relinquish his faith and embrace the Greek religion. He answered by slaying with his own hand the first renegade Jew who approached the altar of idolatry and by pulling down the altar. Mattathias, with his sons and a handful of faithful men, now rose against the national foe and fled to the mountains, where they organized a determined resistance to the Syrian government's measures to force idolatry on the Jews. Mattathias died 166 B.C., and Judas became the leader of the patriots. For subsequent events, see the articles on the different Hasmonæan leaders or princes: Judas Maccabæus; Jonathan; Simon Maccabæus; Hyrcanus; Aristobulus I; Alexander Jannæus; Aristobulus II; Antigonus; Jews. Consult, in addition to our main sources, 1 and 2 Maccabees, and Josephus, *Antiquities*, vol. xii, 6–xiii, 7, especially Emil Schürer, *History of the Jewish People* (Eng. trans., 5 vols., New York, 1896); Wellhausen, *Israelitische und jüdische Geschichte* (7th ed., Berlin, 1914).

MACCABEES, Books of the. Certain deuterocanonical and apocryphal writings, treating chiefly of the history of the Maccabees (q.v.). They consist of four books, of which the first two were received in the Vulgate and declared canonical by the Council of Trent. The third is also considered canonical by the Greek church. The First Book—the most important—comprises the period 175–135 B.C. and relates the attempt of Antiochus IV Epiphanes to suppress the Jewish cult and force the people into acknowledgment of the Greek gods (chap. i); the rising of Mattathias and his sons against the oppressor (chap. ii); the heroic deeds of Judas Maccabæus (chaps. iii–ix. 22); of Jonathan (chaps. ix. 23–xii); and of Simon, until the election of John Hyrcanus to the dignity of high priest (chaps. xiii–xvi). The account bears, on the whole, the marks of great accuracy and proceeds chronologically following the Seleucid era. According to Origen and Jerome, this book was originally written in Hebrew, and internal evidence confirms the correctness of this view. The original text is lost, but the Greek translation is a faithful reproduction. The author, a Palestinian and a patriotic Jew, was devoted to the Hasmonæan dynasty. He must have stood close to the centre of political life in Palestine. All the evidence available is in favor of the assumption that the book was finished shortly after the death of John Hyrcanus (say between 100 and 90 B.C.), and the vividness of the descriptions makes it highly probable that the author was himself a witness of some of the Maccabæan struggles and writes in part from personal observation and reminiscences. Except for the documents which the author incorporates into his book and the various speeches which are not to be regarded as authentic or verbatim (any more than in the narratives of Greek historians), the first book of Maccabees is a trustworthy source for the period it covers, though, of course, the events are colored by the author's fervent partisanship.

The second book of the Maccabees differs widely from the first. It also deals with the national uprising, but covers only the 15 years from 175 to 161 B.C. Prefixed to the history are two letters (chaps. i–ii. 18), purporting to have been sent from the Palestinian to the Egyptian Jews, inviting them to celebrate the feast of the reinauguration of the temple. The author then announces in a preface the subject of his work and his source, which is a history of the period in "five books," composed by Jason of Cyrene (q.v.). Of this larger work he gives an epitome. He begins with the attempted spoliation of the temple by Heliodorus, under Seleucus Philopator, and ends with the death of Nicanor. The author concludes with an epilogue in regard to his own work. While the contents of the two letters correspond to the conditions prevailing at the time of the dates attached, which are equivalent to 143 and 124 B.C. respectively, the letters themselves are fabrications and were probably written originally in Hebrew. The extract from Jason's work—a history embellished by additions, of a partly moralizing, partly legendary nature—contains many chronological and historical errors and bears the stamp of being written merely for religious and didactic purposes. The history of Jason was composed by a contemporary of persons who had taken part in the Maccabæan struggle, but he probably received his information orally at second hand. The epitomist, who prefixes the two letters, wrote in Greek, apparently in Alexandria, in the middle of the first century B.C.

The third and fourth books of the Maccabees are only remotely connected with the Maccabæan history. The third book may be described as a religious novel, the subject of which is the triumph of the Jews over their enemies. It deals with a supposed pre-Maccabæan incident—the miraculous deliverance of the Jews of Egypt from the attempt of Ptolemy Philopator (221–204 B.C.) to destroy them in revenge for a humiliation which he suffered during a visit to Jerusalem, when he endeavored to enter the temple, but was prevented by divine intervention. Five hundred elephants are set upon the Jews, imprisoned in the hippodrome; but two angels intervene, and the elephants turn against the men of Ptolemy's army and trample them to death. The Jews are set free, and the King, besides providing a banquet lasting seven days, issues a proclamation in their favor. The book, which has, of course, no historical value whatsoever, was probably written by an Alexandrian Jew in Greek at the close of the first century B.C., as an encouragement to the Jews in their struggle against Roman subjection. The book is not referred to by any of the early Jewish writers, and the earliest Christian witness to it occurs in the third century A.D.

The fourth book is of a homiletical character. It consists of two parts: (1) a philosophical discussion on the thesis that "the pious reason is absolute master of the passions," followed by (2) illustrations of the thesis by stories of Jewish martyrs. In the second portion the author reproduces chaps. iii–vii of the second book of Maccabees, which accounts for the title of the book. It was formerly held that the book was by Josephus, but Freudenthal has shown conclusively that the author was a Hellenistic Jew, probably of Alexandria, who wrote at the beginning of the Christian era. While of no historical value and marred by exaggerated accounts of the sufferings of Jewish martyrs, it is of great interest because it affords a picture of family life among the Jews in the writer's days, as also for some of its doctrines, e.g., that the death of a martyr is an expiatory offering for his people.

A fifth book of the Maccabees is sometimes referred to. It is an Arabic work printed in the Paris and London Polyglots with Latin translation, and contains a history of the Jews beginning with the account of Heliodorus (2 Macc. iii) and ending with the downfall of the Hasmonæans. It is based upon 1 and 2 Maccabees and Josephus.

Bibliography. English translations of the books of the Maccabees have been published by Cotton, Bagster, and Churton; but they have all been superseded by the versions accompanied by introductions and brief comments by Oesterley (1 Macc.), Moffatt (2 Macc.), Emmet (3 Macc.), and Townshend (4 Macc.), in R. H. Charles, *Apocrypha and Pseudepigrapha of the Old Testament* (Oxford, 1913); there is a German translation by Kautzsch in *Die Apokryphen und Pseudepigraphen des alten Testaments* (Tübingen, 1898). For special treatises, consult: Freudenthal, *Die Flavius Josephus beigelegte Schrift über die Herrschaft der Vernunft* (Breslau, 1869); Willrich, *Juden und Griechen* (Göttingen, 1896); Niese, *Kritik der beiden Makkabäerbücher* (Berlin, 1900); Laqueur, *Kritische Untersuchungen zum zweiten Makkabäerbuch* (Berlin, 1904); also, the Hebrew histories of Wellhausen, Guthe, and Stade, and Emil Schürer, *History of the Jewish People in the Time of Christ*, vol. i (New York, 1896).

MACCABEES, THE. A secret, fraternal, beneficiary society, organized at London, Ontario, in 1878 by members of the Order of Foresters to provide life, accident, sick, and disability fraternal insurance. It was reorganized along more permanent lines in 1881 at Buffalo and chartered that year in Michigan as Knights of the Maccabees—in later years referred to as Knights of the Maccabees of the World. The society had indifferent success for a year or two, but, beginning in 1883, with headquarters at Port Huron, Mich., it rapidly extended its membership throughout the country. Like some other similar organizations it suffered from schism, and a rival Maccabees organization, known as Knights of the Modern Maccabees, was the result. That also had a country-wide organization. Their ritualistic backgrounds are understood to be based on the traits of character of the ancient Maccabean family in the prolonged Jewish war for political and religious liberty about a century and a half B.C. The headquarters of the Modern Maccabees were at Detroit, but in the fall of 1914 these Maccabean fraternities united under the title The Maccabees. The supreme governing body is known as the Supreme Tent, while State governing organizations are Great Camps. Aggregated assets of both societies are nearly $20,000,000, and together, within 33 years, they have paid claims of about $80,000,000 in the United States and Canada. Prior to 1914 these fraternities exercised each an advisory guardianship, without official connection, over what have often been considered as women's auxiliary organizations—the Ladies of the Maccabees of the World and the Ladies of the Modern Maccabees. The former has about 172,000 members and the latter about 50,000. The first named has disbursed $10,896,000 in benefits since 1892, when it was founded, and the second about $6,696,000 since 1886, when it was organized. Each makes its own rules and regulations and handles its own funds. Nothing had been heard by May, 1915, of the women Maccabee sisterhoods having a plan to consolidate.

McCALL′, EDWARD EVERETT (1863–). An American judge and public official. He was born at Albany, N. Y., graduated from the law department of New York University in 1884, and thereafter practiced law in New York City until 1902. He served as justice of the Supreme Court of New York in 1902–13 and then was appointed by Governor Sulzer chairman of the Public Service Commission of the First District. In 1913 he was candidate for mayor of New York on the Tammany ticket, but was defeated by the fusion candidate, John Purroy Mitchel. In 1915 his administration as commissioner was subjected to legislative investigation by the Republican Assembly.

McCALL, GEORGE ARCHIBALD (1802–68). An American soldier, born in Philadelphia. He graduated at West Point in 1822, entered the army, and was commissioned a captain in 1836, major in 1847, and colonel in 1850. He served with distinction in the Florida and Mexican wars, was made inspector general in 1850, and resigned from the army in 1853. In 1861 he took command of the Pennsylvania Reserves, with rank of brigadier general of volunteers. He was taken prisoner at the battle of Frazier's Farm. He resigned in 1863. He wrote *Letters from the Frontier* (1868).

McCALL, JOHN AUGUSTIN (1849–1906). An

American insurance official, born in Albany, N. Y. He served as a clerk in the Connecticut Mutual Life Insurance Company until 1877, when he entered the service of the New York State Insurance Department, becoming superintendent in 1883. In 1887 he was made comptroller of the Equitable Life Assurance Society of New York, and in 1892 president of the New York Life Insurance Company. The legislative insurance investigation of 1905 showed that, notwithstanding the enormous growth of the company under his direction, there had been extravagance and illegitimate expenditures for political and other purposes. He resigned in January, 1906, and died two months later of cancer. It was thought that his death was hastened by worry over his business troubles.

McCALL, Samuel Walker (1851–). An American Congressman and writer. He was born at East Providence, Pa., graduated from Dartmouth College in 1874, was admitted to the bar in 1876, and thereafter practiced law in Boston. In 1888–89 he was editor in chief of the Boston *Daily Advertiser*. He was a delegate to the Republican National Conventions of 1888 and 1900, was a member of the Massachusetts House of Representatives in 1888–89 and 1892, and from 1893 to 1913 served in the Fifty-third to the Sixty-second Congresses. In 1914 he was Republican candidate for Governor of Massachusetts, but was defeated by David L. Walsh. Besides magazine articles, he is author of *Life of Thaddeus Stevens*, in the "American Statesman Series" (1899); *The Business of Congress* (1911); *The Life of Thomas Brackett Reed* (1915), and several published addresses, including *The Scholar in Politics a Conservative* (1903), *The Newspaper Press* (1912), and *Daniel Webster* (1913).

MacCALMONT, mak-kăl′mont, Earl. See Cairns.

MacCAMERON, ma-kăm′ẽr-on, Robert Lee (1866–1912). An American portrait and figure painter. He was born in Chicago and studied under Chase in New York and at the Beaux-Arts, Paris, under Gérôme and Collin. He made his home in Rochester, N. Y. Although an able and even distinguished portrait painter, he is better known for his imaginative interpretations of the life of the underworld, or the *demimonde*—the cafés and theatres. While rendered with great truth, they are nevertheless tinged with poetic mysticism and, in spite of the dreariness of many of the subjects, possess æsthetic beauty and show rich and luminous color and clever light effects. Among the most interesting are: "A Group of Friends," also called "Wormwood" (1908), Corcoran Gallery, Washington; "The Last Supper" (1909), a religious picture in which he strives to convey the spiritual meaning as well as the dramatic possibilities of the scene; "Les Habitués" (The Old Customers), Wilstach Gallery, Philadelphia; "The Daughter's Return" (1909), Metropolitan Museum, New York; "The People of the Abyss" (1912). One of his best portraits is that of Auguste Rodin, in the Metropolitan Museum, New York. He received the cross of the Legion of Honor in 1912.

McCARREN, ma-kăr′en, Patrick Henry (1849–1909). An American politician, born at East Cambridge, Mass. Before his twenty-first year he had been defeated for the Democratic leadership of his district at Brooklyn, N. Y. In 1881 he was elected to the New York Assembly and was reëlected in 1883 and 1887. He was beaten in the elections for the State Senate in 1885, but in 1889 was successful, and thereafter until his death was continuously a member of that body. Shortly after becoming virtual leader of the Brooklyn democracy in 1893, he broke with Charles F. Murphy, the leader of Tammany Hall. The fight between these two leaders became particularly bitter in the elections of 1904. Refusing to accept Tammany's nomination of Hearst for Governor in 1906, McCarren and his delegates were excluded from the State Convention by the Murphy-Conners combination, and in 1908, at the expressed wish of Bryan, they were also kept out of the Democratic National Convention at Denver. McCarren was one of the strongest opponents of Governor Hughes's reform measures.

McCAR′THY, D'Alton (1836–98). A Canadian lawyer and political leader. He was born near Dublin, Ireland, and in early youth was brought by his parents to Ontario. He was educated at the Barrie Grammar School, studied law, was called to the bar in 1858, and was made a queen's counsel in 1872. He soon attained very high rank as a lawyer, both in jury cases and in arguments in appeal cases in Canada and before the Privy Council in England. He was elected a Conservative member of the House of Commons in 1876 and retained a seat therein until his death. Until 1889 he was a supporter and trusted adviser of Sir John A. Macdonald, and he was for some time looked upon as the latter's successor in the party leadership. On the refusal of the Dominion cabinet to disallow the Jesuits' Estates Act (see Mercier, Honoré), McCarthy left the Conservatives and became the chief founder of the Equal Rights party. His public speeches aided the Liberals in opposing special legislation in the interest of Catholic education and materially contributed to the accession to power of the Laurier administration in 1896. His object in seceding from the Conservative party was thus in large measure attained, and he took no further part in active politics. He was for some time president of the Canadian branch of the Imperial Federation League, and later a member of the Council of the British Empire League.

MacCARTHY, Denis Florence (1817–82). An Irish poet, born in Dublin. He studied for the Church and afterward for the bar, but finally gave himself to literary work and lived principally in London and Dublin. Between 1854 and 1873 he translated admirably several plays of the Spanish dramatic poet Calderón de la Barca (q.v.), receiving therefor a medal from the Spanish Royal Academy. His original writings include: *Ballads, Poems, and Lyrics* (1850); *Under-Glimpses* (1857); *The Bell-Founder* (1857); *The Centenary of Moore* (1880); *Shelley's Early Life* (1872).

MacCARTHY, Hamilton Thomas (1847–). A Canadian sculptor. He was born in London, England, and was educated there, in his father's studio, and on the Continent. After several years' residence in London, where he executed works for Queen Victoria and the Corporation of the City, he came to Toronto, Ontario, in 1885, and after 13 years removed to Ottawa. He was elected a member of the Royal Canadian Academy (1890) and a councilor thereof in 1906. Among his works are the statue of Sir John A. Macdonald in Toronto, and bronze monuments in commemoration of the South African War erected in Halifax, Ottawa, Charlottetown, Quebec, and Brantford; also monuments to Sieur de Monts, at Annapolis Royal, Nova Scotia, and to Champlain, at St. John, New Brunswick. For the national monument to Alexander Mackenzie, Premier of Canada, on Parliament Hill, Ottawa, he collaborated with Louis Philippe Hébert (q.v.).

McCARTHY, Justin (1830–1912). An Irish historian, journalist, and Nationalist leader. He was born at Cork, Nov. 22, 1830. When 16 years old, he joined the staff of the Cork *Examiner* and in 1853 the Liverpool *Northern Times.* After a year as reporter in the House of Commons for the *Morning Star,* he became foreign editor of that paper in 1861, and editor in chief in 1864, remaining in the latter position four years. In 1868 he made a tour of the United States, where he remained three years, a valued contributor to various magazines and for a time editorially connected with the *Independent.* On his return he became an editor of the *Daily News,* at the same time writing regularly for many of the leading English magazines. Entering the House of Commons in 1879, he became prominent in the Irish Home Rule party and was in 1886 vice president of the Irish National League. In the same year a second but briefer visit was made to America. After the deposition of Parnell from the leadership of the Home Rule party in 1890, McCarthy was made its chief, retaining the post until 1896. He remained in Parliament till 1900, sitting for the County of Longford in 1879–85, for Londonderry in 1886–92, and for North Langford in 1885–86 and 1892–1900. He died at Folkestone, April 24, 1912. McCarthy's reputation as an historian rests chiefly on his *History of our Own Times,* the first volume of which appeared in 1879 and the last in 1905. It treats of the reign of Victoria and nearly half that of Edward VII and is brilliant and popular. Among his other historical works are: *Epochs of Reform* (1882); *The French Revolution* (1890); *Life of Sir Robert Peel* (1891); *The Story of Gladstone's Life* (1897); *Modern England* (1898); *The Reign of Queen Anne* (2 vols., 1902); *Short History of our Own Times* (1908). His *History of the Four Georges* (4 vols., 1884–1901) was written in part by his son, Justin. He also wrote novels, for the most part early in his career; among the best are: *A Fair Saxon* (1873); *Dear Lady Disdain* (1882); *Miss Misanthrope* (1877). With Egan, Welsh, Hyde, and others, he edited *Irish Literature* (10 vols.). *Reminiscences* (2 vols., 1899), *The Story of an Irishman* (1904), and *Irish Recollections* (1911) are autobiographical. Consult also *Our Book of Memories: Letters of Justin McCarthy to Mrs. Campbell Praed* (Boston, 1913).

McCARTHY, Justin Huntley (1860–). An English dramatist, novelist, and historian, son of Justin McCarthy. He was educated at University College, London. He did much work as a journalist and traveled widely. From 1884 to 1892 he was a member of Parliament. His numerous publications include: *An Outline of Irish History* (1883); *Serapion and Other Poems* (1883); *England under Gladstone* (1884; enlarged ed., 1886); *Camiola* (1885); *History of the French Revolution* (1890–97); *The Dryad* (1905); *The Flower of France* (1906); *The God of Love* (1909); *The Fair Irish Maid* (1911); *A Health unto His Majesty* (1912); *Calling the Tune* (1913); *Fool of April* (1914). In addition he translated Omar Khayyam and Hafiz, edited various classics, and wrote several plays—*The Candidate, The White Carnation, The Highwayman, The Wife of Socrates, If I Were King,* and *The Proud Prince,* all of these prior to 1915.

McCARTHY, Lillah (?–). An English actress and theatrical manager, born at Cheltenham. She studied elocution under Hermann Vezin and Emil Behnke, and made her first appearance on the stage in 1895. She joined Wilson Barrett at the Lyric, London, in 1896–97, and after touring in Australia she became leading lady with him in 1900, playing in *Quo Vadis?, The Sign of the Cross, Virginius, Hamlet,* and *Othello.* She then accompanied Barrett to South Africa and Australia. In 1904 she played with Beerbohm Tree at His Majesty's Theatre in *Agatha, A Man's Shadow,* and *Julius Cæsar.* Subsequently she appeared in *Man and Superman* (1905); *Pan and the Young Shepherd* (1906); *Arms and the Man* (1907); *What Every Woman Knows* (1908); *Strife* (1909); *Grace* (1910); *The Tragedy of Nan* (1911); *Twelfth Night* (1912). She married H. Granville Barker (q.v.) in 1906, assumed the management of the Little Theatre, London, in 1911, and was associated with her husband in the management of the Savoy in 1912. In 1915 she played with her husband's company at Wallack's Theatre in New York City in *Androcles and the Lion, A Midsummer Night's Dream, The Man who Married a Dumb Wife,* and *The Doctor's Dilemma,* and at various colleges in outdoor performances of Euripides' *Trojan Women* and *Iphigenia in Tauris.*

McCAUL, m*a*-ka̤l′, John (1807–86). A Canadian educator and classical scholar, born in Dublin, Ireland. He was educated at Trinity College, Dublin, where he later became classical tutor and examiner, and after studying theology he was ordained a clergyman of the Church of England. In 1839 he went to Upper Canada (Ontario) as principal of Upper Canada College, Toronto, and in 1842 he was appointed vice president of, and professor of logic and rhetoric in, the University of King's College in that city. After King's College had been deprived of its denominational privileges and a new provincial university created in 1853, composed of the University of Toronto as a degree-conferring, and University College as a teaching, body (provision being made for the affiliation of other colleges to the university), McCaul was appointed president of, and professor of classics in, University College, and vice chancellor of the university. He was elected president of the Canadian Institute in 1863. For some years he edited a literary monthly magazine, *The Maple Leaf.* He wrote extensively on classical subjects, including the Greek tragic and the Latin metres, and published excellent editions of parts of Longinus, Lucian, Horace, and Thucydides. He was an authority on Latin inscriptions. His two best-known works are *Britanno-Roman Inscriptions* (1863) and *Christian Epitaphs of the First Six Centuries* (1865).

MacCAULEY, m*a*-ka̤′lĭ, Clay (1843–). An American Unitarian clergyman, born at Chambersburg, Pa. He was a lieutenant of Pennsylvania Volunteers in 1862–63, graduated from Princeton University in 1864 and from the Theological Seminary of the Northwest, Chicago, in 1867, and studied at Heidelberg in 1873. Ordained to the Unitarian ministry in 1868, he held pastorates at Waltham, Mass. (1869–72), and at Washington (1876–81). He directed the Unitarian mission to Japan from 1890 to 1900 and again after 1909, was president and professor of philosophic and historic theology at the College for Advanced Learning at Tokyo in 1891–99, and lectured on Japan in 1904–09. He is author of *Christianity in History* (1891); *Religious Problem of Japan—How to Solve it?* (1894); *Introductory Course in Japanese* (1896, 1905); *Present Religious Condition of Japan* (1902); *Unitarian Mission to Japan* (1909); *A Daughter of the Samurai* (1910); *Thought and Fact for Today* (1911); *Charles Dickens: An Appreciation* (1912); *The Faith of the Incarnation* (1913); *Present Day Problems* (1914).

MacCHES′NEY, Clara Taggart (1861–). An American portrait and genre painter. She was born at Brownsville, Cal., and studied under Virgil Williams in San Francisco, Mowbray and Beckwith in New York, and Courtois and Girardot in Paris. She resided for several years in France and Holland, and for long her favorite subjects were studies of peasant life, especially mothers and babies. She was awarded two medals at the World's Columbian Exposition in 1893, and received the Dodge prize, New York, in 1894, and a gold medal at Philadelphia in 1900. At the Paris Exposition of 1900 she was represented by "The Old Blind Fiddler," and "Pomegranates." At the exhibition of the National Academy of Design, New York, in 1901, she was awarded the second Hallgarten prize for "A Good Story," now in the National Arts Club, New York. Among her best-known paintings are "Retrospection" (Boston Art Club) and "The Discovery" (Union League Club, Chicago). Her portraits include those of George Pardee (State Capitol, Sacramento, Cal.), Mr. McMahon (Emigrant Savings Bank, New York), Dr. Moncure Conway, and Dr. Elizabeth Corbett (1913).

MACCHIAVELLI, mä′kyȧ-vĕl′lē, Niccolò. See Machiavelli.

McCHORD, m*a*-kôrd′, Charles Caldwell (1859–). An American lawyer, an expert on interstate commerce. Born at Springfield, Ky., for many years he was identified with the life of his native State. He studied at Central College (now University) and after his admission to the bar in 1882 practiced law at Louisville, until the end of 1910, being a member of the firm of McChord, Hines, and Norman. He served as prosecuting attorney of Washington County (1886–92) and was chairman of the State Railroad Commission (1892–95, 1899–1907); while a member of the Kentucky Senate (1895–99), he drew up the successful McChord railroad rate bill and represented the State in numerous railroad rate cases. On Dec. 31, 1910, he became a member of the Interstate Commerce Commission by appointment of President Taft. In 1906–07 he served as president of the National Association of Railway Commissioners.

McCLAIN, m*a*-klān′, Emlin (1851–1915). An American judge and legal scholar. He was born at Salem, Ohio, and was educated at the State University of Iowa (Ph.B., 1871; LL.B., 1873), where he was afterward professor of law (1881–87), vice chancellor of the law department (1887–90), and chancellor of the university (1890–1900). He practiced law at Des Moines, Iowa, in 1873–81; from 1901 to 1912 served as judge of the Supreme Court of Iowa, of which he was Chief Justice in 1906 and 1912; and in 1913 became professor of law at Leland Stanford Junior University. He was a member of the Iowa Code Commission in 1894–97 and annotated the new code in 1897, with supplements in 1902, 1907, and 1913. He published: *Annotated Statutes of Iowa* (1880); *Outlines of Criminal Law and Procedure* (1884); *Digest of Iowa Reports* (2 vols., 1886; new ed., 1908); *Cases on the Law of Carriers* (1896; 3d ed., 1914); *A Treatise on the Criminal Law as now Administered in the United States* (2 vols., 1897); *A Selection of Cases on Constitutional Law* (1900; 2d ed., 1909); *Constitutional Law in the United States* (1905; 2d ed., 1910).

McCLEL′LAN, George Brinton (1826–85). A distinguished soldier in the American Civil War. He was born in Philadelphia, Dec. 3, 1826. He attended the University of Pennsylvania for two years and graduated at West Point in 1846. He distinguished himself in the Mexican War, and for gallantry in the battles of Contreras and Churubusco he was brevetted first lieutenant, and for similar conduct at Chapultepec he was brevetted captain. On his return he was appointed to an instructorship at West Point, and while there prepared a *Manual of Bayonet Exercises*, adapted from the French, which became a part of the system of instruction. He was assistant engineer in the construction of Fort Delaware, was chief engineer in charge of the coast surveys in Texas, collected railroad statistics for the War Department, was promoted in 1855 captain of artillery, and was one of the three officers appointed on the military commission to visit the seat of war in the Crimea and report upon the condition of the European armies. The fruit of this was *Armies in Europe* (1861). On his return in 1857 he resigned his commission and became successively chief engineer and vice president of the Illinois Central Railroad and president of the St. Louis and Cincinnati Railroad. At the opening of the Civil War he was appointed to the position of major general of the Ohio volunteers and made a successful campaign in what later became West Virginia, driving out the enemy and capturing 1000 prisoners. He had been commissioned major general in the regular army May 14, 1861. He now received the thanks of Congress and after the first disaster to the Federals, at Bull Run, was placed in command of the Army of the Potomac. Upon the retirement of Lieutenant General Scott in November, 1861, he was appointed commander of the armies of the United States. He spent the winter in reorganizing and drilling his forces and whipping into shape the Army of the Potomac; in March, 1862, he removed to the Yorktown Peninsula in order to attack Richmond from that base.

President Lincoln was continually insisting upon a forward movement, but instead of following his advice, McClellan sat down before Yorktown and began a scientific siege of the place. After its evacuation by the Confederates and the engagement at Williamsburg, McClellan moved leisurely up the peninsula only to be subjected to a great disappointment in the dispatch of McDowell's 40,000 men to the Shenandoah—an army upon whose aid McClellan had confidently counted. Then followed various engagements ending with the Seven Days' battles (q.v.), in which the Federal armies were generally successful, although the loss in men was large and Richmond was still untaken. There was dissatisfaction at Washington with the result, and in July McClellan was superseded by Halleck as general in chief. He was then ordered to evacuate the peninsula and go to the aid of General Pope, then in command of the Army of Virginia, but arrived too late to be of any great assistance. After the disastrous campaign of Pope, culminating in his defeat in the second battle of Bull Run, McClellan was again placed in active command of the Army of the Potomac. Organizing his army as he proceeded, he followed Lee into Maryland, and with him fought the battle of Antietam (q.v.), Sept. 16–17, 1862. This, though tactically a drawn battle, was strategically a Federal victory; but in view of the great disparity between the numerical strength of the two armies and of McClellan's failure vigorously to pursue Lee's retreating army, the result was not satisfactory to the government, and in November he was superseded in his command by General Burnside. After this he took no further part in the war. McClellan always asserted that the administration at Washington not only refused to coöperate with him in his military operations, but even attempted to discredit him on account of his political opinions. The President and the Secretary of War, on the other hand, insisted that General McClellan was not aggressive and prompt enough in the circumstances, but too often pursued a dilatory policy, which caused him to win only fruitless victories, and that he disregarded the advice and suggestions of the commander in chief. In 1864 he was nominated by the Democratic party as its candidate for President of the United States on a platform which denounced the war as a failure. To this view, however, McClellan did not subscribe, and in his letter of acceptance he advocated a vigorous prosecution of the war. He was defeated by Lincoln. In the Electoral College the vote stood 212 for Lincoln and 21 for McClellan, while the popular vote for Lincoln was 2,200,000 and for McClellan 1,800,000. Already in September he had resigned from the army, and after the election went to Europe, where he remained until 1868. Upon his return he lived in Orange, N. J., and had offices as an engineer in New York until 1877, when he was elected by the Democrats Governor of New Jersey. He served with credit for one term, but declined a renomination. As a scientific engineer and military tactician, McClellan had few superiors. Among his literary works may be mentioned a narrative entitled *McClellan's Own Story* (New York, 1887) and reports on military campaigns and military organization. Consult: A. S. Webb, *Peninsula: McClellan's Campaign of 1862* (New York, 1881); J. F. Rhodes, *The First Six Weeks of McClellan's Peninsular Campaign*, published by the Massachusetts Historical Society (Boston, 1895–96); J. C. Ropes, *Story of the Civil War*, vol. ii (New York, 1895); P. S. Michie, *General McClellan* (ib., 1901), in the "Great Commanders Series"; Gamaliel Bradford, "Union Portraits," in *Atlantic Monthly*, vol. cxiv (Boston, 1914).

McCLELLAN, George Brinton (1865–). An American politician, statesman, and educator, born in Dresden, Saxony, where his father, Gen. George B. McClellan (q.v.), and mother were visiting. He received his A.B. at Princeton University in 1886 and his A.M. in 1889; and Princeton, Fordham, and Union later gave him the honorary degree of LL.D. After leaving school, he engaged in reportorial and editorial work on the New York *World* and other newspapers. In 1892 he was admitted to the bar. He served for a time as secretary and treasurer of the New York and Brooklyn Bridge. In 1893 he was elected president of the board of aldermen of New York, and for a part of the following year he was acting mayor, although still in his twenties. His success and popularity enabled him in 1895 to become Congressman (Democratic), a position he held until 1903. He was a prominent member of the Ways and Means Committee, urged downward revision of the tariff and an economic administration of the government, and denounced the imperialistic programme of the Republicans. In 1903 he was selected by the Tammany organization as candidate for mayor of New York City against Seth Low. He ran as a conservative and was elected largely because of the reaction of that year against progressive legislation. His administration was efficient, but he was charged with being subservient to Tammany Hall. In 1905 he was again the candidate of the organization, being opposed by Hearst and Ivins. The issues most frequently mentioned in the bitter campaign were municipal ownership of certain public utilities and boss rule. The result of the election was favorable to McClellan by a very slight plurality, and Hearst contested the returns, but the courts declined to sustain him. In the second term (four years) charges of undue dependence on Tammany were more frequent and bold, and he was not seriously mentioned for renomination in 1909. Throughout his political career he remained interested in education and in 1906 was made chancellor of Union University. At Princeton he delivered the Stafford Little lectures on public affairs (1908–10), served as university lecturer in 1911–12, and was then appointed professor of economic history.

McCLELLAND, James Henderson (1845–1913). An American surgeon, born in Pittsburgh. He graduated in 1867 from the Hahnemann Medical College in Philadelphia, to which, after being connected with the Homœopathic Hospital in Pittsburgh, he returned (1876) as professor of surgery.

McCLER'NAND, John Alexander (1812–1900). An American soldier. He was born in Breckenridge Co., Ky., was brought up in southern Illinois, and in 1832 was admitted to the bar. In 1833, after having served as a private in the Black Hawk War, he resumed the practice of his profession and also engaged in mercantile pursuits. In 1835 he became the editor and publisher of the Shawneetown (Ill.) *Democrat*. From 1836 until 1842 he represented his district in the State Legislature and from 1843 to 1851 he was a Democratic member of Congress from Illinois. In 1851 he removed from Shawneetown to Jacksonville and in 1859 became again a Representative in Congress. At the outbreak of the Civil War, having been appointed brigadier general on May 17, 1861, he raised, largely through his personal influence, the McClernand Brigade. In February, 1862, he gallantly led his command in the attack on Fort Donelson; was promoted in the following March to be a major general of volunteers; and commanded a division, April 6 and 7, at the battle of Shiloh (q.v.). On Jan. 4, 1863, he superseded Gen. W. T. Sherman in the command of the expedition against Vicksburg, but was soon afterward relieved by General Grant. His division having been combined with the naval forces under Admiral Porter (January

11), he commanded the expedition that finally carried by storm the garrison village of Arkansas Post. He also distinguished himself in the battles of Port Gibson, Champion Hill, Big Black River, and Baker's Creek. In July, 1863, he was relieved of the command of the Thirteenth Army Corps, and on Nov. 30, 1864, he resigned from the service and retired to private life, resuming the practice of the law at Springfield, Ill. Consult Rhodes, *History of the United States from the Compromise of 1850*, vols. iii, iv, v (New York, 1907).

MACCLESFIELD, măk′k'lz-fēld. A manufacturing town in Cheshire, England, on the river Bollin, 15 miles southeast of Manchester (Map: England, D 3). Notable buildings are the church of St. Michael's, founded in 1278; a grammar school endowed in 1502; the town hall and the insane asylum. It contains water and gas works, markets, cemetery, two parks, and bath, and maintains a free library and technical schools. Silks and other textiles are manufactured. In the vicinity coal, slate, and stone are obtained. Macclesfield was a portion of the Mercian royal demesne; it became a borough in 1261 and was incorporated in 1678. Pop., 1901, 34,624; 1911, 34,797.

McCLIN′TOCK, Emory (1840–1916). An American actuary. Born at Carlisle, Pa., he graduated in 1859 from Columbia University, where he was tutor in mathematics in 1859–60. From 1863 to 1866 he served as United States consular agent at Bradford, England. He was actuary of the Asbury Life Insurance Company, New York (1867–71), of the Northwestern Mutual Life Insurance Company, Milwaukee, Wis. (1871–89), and of the Mutual Life Insurance Company, New York (1889–1911). Of the Mutual he was vice president in 1905–11, trustee after 1905, and consulting actuary after 1911. He served as president of the American Mathematical Society in 1890–94 and of the Actuarial Society of America in 1895–97.

McCLINTOCK, Sir Francis Leopold (1819–1907). An English naval officer and explorer. He was born in Ireland, entered the navy in 1831, and in 1838 went to South America in the steamship *Gorgon*. He was a member of the Arctic expedition in 1848 under Sir James C. Ross and in 1850 was first lieutenant of the *Resistance* in the Arctic expedition for the relief of Sir John Franklin. On his return to England he was made commander and in 1852 served under Sir Edward Belcher in a third Arctic expedition, when he commanded the *Intrepid*. McClintock was the most prominent figure in the Franklin search expeditions. Although a captain he took the field and confirmed his reputation as the greatest of Arctic sledge men. Without dogs he traveled for 225 days in 1852–53 and made good 2421 miles. His greatest feat was a journey of 145 days, in which he traveled 1661 miles without disaster. He is best known through his discovery of the fate of Sir John Franklin (q.v.). In 1857, in command of the *Fox*, fitted out by Lady Franklin, he started on a new search for Sir John Franklin, and made the first discovery of the explorer's death on the northwestern coast of King William Land. On his return in 1859 he was knighted, and received the degree of doctor of laws from the universities of Oxford, Cambridge, and Dublin. He was made a rear admiral in 1871 and a vice admiral in 1877; was in command of the North American and West Indian station from 1879 to 1882; and was promoted to be full admiral in 1884. A memorial to McClintock has been erected in Westminster Abbey. He published *Voyage of the Fox in the Arctic Seas* (1859).

McCLINTOCK, John (1814–70). An American Methodist Episcopal theologian. He was born in Philadelphia, Oct. 27, 1814, and graduated at the University of Pennsylvania in 1835. He was ordained a minister of the Methodist Episcopal church, and was professor of mathematics and of Greek and Latin in Dickinson College from 1836 to 1851. In 1848 he was elected by the General Conference editor of the *Methodist Quarterly Review*, retaining the position for eight years. In 1856 he was appointed, with Bishop Simpson, a delegate to the Wesleyan Methodist Conference of England and to the meeting of the Evangelical Alliance held at Berlin. In 1857 he became pastor of St. Paul's Methodist Church in New York and in 1860 was preacher in the American Chapel in Paris. During the Civil War he advocated with ability the Union cause, and his home in Paris was a rallying centre for patriotic Americans. Returning to America in 1864, he was again, for a short time, placed in charge of St. Paul's Church in New York. His health failing, he resigned in 1865 and resided in Germantown, Pa. In 1866 he removed to New Brunswick, N. J., supplying for a time St. James's Church, and was made chairman of the Central Centenary Committee of the Methodist Episcopal Church. In 1867 he became president of Drew Theological Seminary, Madison, N. J., and held the position till his death there, March 4, 1870. Besides numerous articles in periodicals, he published a translation of Neander's *Life of Christ* (1847); *Sketches of Eminent Methodist Ministers* (1863); *The Temporal Power of the Pope;* a translation of Bungener's *History of the Council of Trent* (1851); and prepared, in collaboration with Dr. Blumenthal, *Analysis of Watson's Theological Institutes* (1850). In the last 20 years of his life he labored in preparing the *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature*, in connection with Dr. James Strong. At the time of his death three volumes had been published; the work was continued by Dr. Strong and finished in 1887 (12 vols.). A volume of Dr. McClintock's sermons, entitled *Living Words* (1871), and *Lectures on Theological Encyclopædia and Methodology* (1873) were published after his death. Consult his *Life* by Crooks (New York, 1876).

McCLOS′KEY, John (1810–85). An American Roman Catholic prelate. He was born in Brooklyn, was educated at Mount St. Mary's College, Emmitsburg, Md., and pursued his theological studies there, in Rome, and in France. He was ordained to the priesthood in 1834, and on his return from Europe became pastor of St. Joseph's Church, New York. In 1841 he was made the first president of St. John's College, Fordham, N. Y., but returned to parochial work in the next year. He was appointed coadjutor to Bishop Hughes of New York in 1844 and was consecrated titular Bishop of Axiere. In 1847 he was appointed the first Bishop of the new diocese of Albany. He administered the affairs of his see with distinguished ability, built the cathedral at Albany, founded the theological seminary at Troy, erected many churches, established charitable and religious institutions, and introduced monastic orders and lay communities. In July, 1864, he succeeded Dr. Hughes as Archbishop of New York, where his administration was marked by similar energy and resultant growth of the church and its institutions. In 1875 he was made Cardinal. At the Vatican Council of 1869–70 he was a member of the committee on discipline. Cardinal McCloskey was a profound scholar and an effective preacher. He was a sagacious administrator, of great executive ability and a quiet, impressive manner.

McCLOSKEY, William George (1823–1909). An American Roman Catholic bishop, born in Brooklyn, N. Y. He was educated at St. Mary's College, Emmitsburg, Md.; was ordained a priest in 1852; and then spent a year in mission work in New York. He served as instructor (1853–57) and as professor of moral theology and sacred scripture (1857–59) at St. Mary's, and as president of the American College in Rome from 1859 to 1868. In the latter year he was appointed Bishop of Louisville.

McCLUNG, m*a*-klŭng′, Clarence Erwin (1870–). An American zoölogist, born at Clayton, Cal. He was educated at the University of Kansas (Ph.G., 1892; Ph.D., 1902), where he was afterward assistant professor of zoölogy (1897–1900), associate professor (1900–06), head of the department of zoölogy and curator of the vertebrate paleontological collections (1902–13), and acting dean of the School of Medicine (1902–06). In 1913 he became professor of zoölogy and director of the zoölogical laboratory at the University of Pennsylvania. He participated in various scientific expeditions; became associate editor of the *Journal of Morphology;* and is author of many contributions, especially on heredity and on the cretaceous fish of Kansas.

McCLURE, m*a*-klōōr′, Alexander Kelly (1828–1909). An American journalist. He was born at Sherman's Valley, Perry Co., Pa., and after receiving a good elementary education was apprenticed to a tanner at the age of 15, but soon afterward applied himself to newspaper work. In 1850 he bought an interest in the Chambersburg *Repository*, which under his management (1850–56 and 1862–64) became one of the most influential antislavery papers in the region. In 1853 he was the unsuccessful Whig candidate for Auditor General, in 1855 was State superintendent of printing, and in the same year was a member of the State convention that met at Pittsburgh to organize the new Republican party in Pennsylvania. In 1856 he was a delegate to the first National Republican Convention at Philadelphia, and in the same year left newspaper work and was admitted to the bar. In 1857–58 he was a Republican member of the State Legislature, and in 1859 was elected to the State Senate. In the Republican National Convention of 1860 he led the Pennsylvania delegates who deserted Simon Cameron for Lincoln, and afterward, as chairman of the State committee, carried Pennsylvania for the latter. In 1862, as a special assistant adjutant general, he had charge of the draft in Pennsylvania, and in 1864 he was reëlected to the State Legislature. In 1872 he led the Liberal Republican revolt in Pennsylvania, was chairman of that faction's campaign committee, and was elected as an independent to the State Senate. He was defeated as independent candidate for mayor of Philadelphia in 1873 by scarcely 900 votes. He established the Philadelphia *Times* in 1873 and was editor of it until 1901. He wrote: *Three Thousand Miles through the Rocky Mountains; Our Presidents and how we Make them* (1901); *Recollections of Half a Century* (1902); *Old Time Notes of Pennsylvania* (2 vols., 1906).

McCLURE, James Gore King (1848–). An American Presbyterian clergyman and educator. He was born at Albany, N. Y., and graduated from Yale University in 1870 and from Princeton Theological Seminary in 1873. Ordained to the Presbyterian ministry, he was pastor at New Scotland, N. Y., in 1874–79 and at Lake Forest, Ill., from 1881 to 1905. He served as president of Lake Forest University from 1897 to 1901 and of McCormick Theological Seminary after 1905. He is author of *Possibilities* (1896); *The Man who Wanted to Help* (1897); *The Great Appeal* (1898); *Environment* (1899); *For Hearts that Hope* (1900); *A Mighty Means of Usefulness* (1902); *Living for the Best* (1903); *The Growing Pastor* (1904); *Loyalty, the Soul of Religion* (1905); *Supreme Things* (1907).

McCLURE, Sir Robert John le Mesurier (1807–73). An English Arctic explorer, who was first to pass through a Northwest Passage. He was born at Wexford, Ireland, studied at Eton and Sandhurst, and in 1824 entered the navy. In 1836–37 he was mate in the Arctic expedition of H. M. S. *Terror*, Captain Back, and in 1837 received his commission as a lieutenant. From 1842 to 1846 he was in command of the *Romney*, receiving ship at Havana. He joined Sir James C. Ross's first expedition in search of Franklin in 1848, and upon its return in 1849 was promoted to the rank of commander. Almost immediately upon his return from the first expedition it was decided to dispatch the same two vessels, the *Enterprise* and the *Investigator*, upon a second expedition which should proceed by way of Bering Strait. McClure was appointed to the command of the *Investigator*, with Captain Collinson, commanding the *Enterprise*, as senior officer of the expedition. The *Investigator*, with a crew of 66, was provisioned for three years. On Jan. 20, 1850, the vessels set sail, but on April 16 were separated by a gale. The *Investigator* continued northward without waiting for Collinson, and despite the fleet instructions against separation, McClure wintered with his ship fixed in the ice of Prince of Wales's Strait, in lat. 72° 50′ N. and long. 117° 55′ W. In the summer of 1851 he sailed southward and, rounding the west coast of Banks Land, sought refuge on the north of it in a bay named by McClure the Bay of Mercy. Unable to free the ship from the ice, the party remained there two years (1851–53), and with three men dying were on the point of leaving her when almost miraculously the *Investigator* was visited by Lieutenant Pim, of the *Resolute*, one of the relief ships to the eastward. The *Investigator* was abandoned, and her crew traveled with sledges to Belcher's squadron, with which they returned to England in 1854, although not in their own ship, having accomplished the traverse of the Northwest Passage, the discovery of which had been a great goal of Arctic exploration. McClure was promoted to be captain, was knighted, and was appointed to command the *Esk* of the Pacific squadron. He returned in 1861, in 1867 was promoted to be rear admiral, and in 1873 was appointed vice admiral on the retired list. While the honor of having first discovered the Northwest Passage is credited to Sir John Franklin, a committee of the House of Commons awarded £10,000 to McClure for having "discovered a northwest passage and successfully carried his followers from the Pacific to the Atlantic Ocean by that route." Consult Alexander Armstrong, *Narrative of the Northwest Passage* (London, 1857), and Sherard Osborn, *Discovery of a Northwest Passage* (4th ed., ib., 1865).

McCLURE, Samuel Sidney (1857–). An American editor and publisher, born at Frocess, County Antrim, Ireland. He came early to America and graduated from Knox College in 1882. Until 1884 he edited the *Wheelman* in Boston, for several months he was connected with the De Vinne Press in New York, and within the same year he established the McClure Newspaper Syndicate, the first organization of the kind. Its function was to buy manuscripts of authors and sell them for publication simultaneously in various papers. In June, 1893, he began the publication of *McClure's Magazine*, which his brilliant, original, and courageous editorship soon brought into the front rank of American periodicals. Several important series of articles demanded and received serious consideration and respect and won the magazine a host of friends—and of enemies. Such were the serial account of the career of John D. Rockefeller and a scrupulously documented biography of Mrs. Mary Baker Eddy. *McClure's* was notable also for the talented company of novelists and short-story writers who contributed to its success. McClure was also the head of McClure, Phillips & Co., publishers, from 1899 until the business was acquired by Doubleday, Page & Co. The McClure Publications, Incorporated, took over the magazine. In 1915 was formed the S. S. McClure Newspaper Corporation, which first bought the New York *Mail*, Mr. McClure then becoming its editor. Consult his frank and interesting *My Autobiography* (New York, 1914).

McCLURG, ma-klûrg′, Alexander Caldwell (c.1835–1901). An American publisher, born in Philadelphia. He graduated at Miami University, Oxford, Ohio, in 1853 and became associated with the publishing firm of S. C. Griggs & Co. at Chicago. In 1862 he entered the Union army and he became a captain in the Eighty-eighth Illinois Volunteer Infantry. Subsequently he was made a colonel and brevet brigadier general and served through the Atlanta campaign and Sherman's march to the sea as chief of staff of the Fourteenth Army Corps. After the war he became a partner in the Griggs publishing house, and after a few years organized the firm of Jansen, McClurg & Co., later A. C. McClurg & Co., which became the largest book-distributing house in America, and a prosperous publishing house as well. In 1899, after the destruction of the establishment by fire, he reorganized the company on the basis of industrial coöperation, distributed much of the stock gratuitously to the employees, and permitted them to buy more on easy terms.

McCLYMONT, mak-klī′mont, James Alexander (1848–). A Scottish biblical scholar, born at Girvan, Ayrshire, and educated at Girvan Grammar School, at Ayr Academy, Edinburgh University, and Tübingen. From 1874 to his retirement in 1913 he was minister of Holburn Parish, Aberdeen. He served as a member of the general committee of the Church of Scotland, was one of the translators of Beck's *Pastoral Theology of the New Testament*, and wrote: *The New Testament and its Writers* (1892; 2d enlarged ed., 1893); a volume in the *Century Bible* on St. John's Gospel; *The Church of Scotland* (1893); *New Testament Criticism: Its History and Results*, the Baird lectures of 1911 (1913).

MacCOLL′, Evan (1808–98). A Canadian Gaelic poet, born at Kenmore, Scotland. His principal work, *Clàreach nam Beann: or Poems and Songs in Gaelic* (1838), was printed in English the same year under the title *The Mountain Minstrel*, of which five subsequent editions appeared. MacColl went to Canada in 1850 and was employed in the customhouse at Kingston, Ontario, for 30 years. In 1880 he retired and went to live in Toronto, where a complete edition of his works was published in 1883. He was a fellow of the Royal Society of Canada from its inauguration.

MacCOLL, Malcolm (1831–1907). A British theologian and author, born at Glenfinan in Inverness-shire, Scotland. He was educated at Trinity College, Glenalmond, and at the University of Naples. He was appointed assistant curate of St. Paul's, Knightsbridge (1861); chaplain to the British Ambassador at St. Petersburg (1862–63); curate of St. Paul's (1864–67); rector of St. George's, London (1871)—this living presented by Gladstone, of whose Church and Home Rule policies he was an ardent supporter; and canon of Ripon Cathedral (1884). In 1875 he attended the conference of the Eastern and Western churches at Bonn. Among his publications are: *Mr. Gladstone and Oxford* (1865); *Science and Prayer* (1866); *Lawlessness, Sacerdotalism, and Ritualism* (1875); *Christianity in Relation to Science and Morals* (1892); *Responsibility of England toward Armenia* (1895); *The Sultan and the Powers* (1896); *Life Here and Hereafter* (1896).

McCOMB, ma-kōm′. A city in Pike Co., Miss., 105 miles north of New Orleans, La., on the Liberty-White and the Illinois Central railroads (Map: Mississippi, D 8). It is in a productive cotton, corn, and timber region, and among the chief industrial establishments are the shops of two railway systems, an iron and brass foundry, cotton mills, machine shops, and lumber yards. The water works are owned by the municipality. Pop., 1900, 4477; 1910, 6237.

McCOMB, ma-kōm′, John (1763–1853). An American engineer and architect, born in New York. He is credited with the authorship of the designs for the old Government House in New York (1790), on the site of the present subtreasury building; for St. John's Church on Varick Street; the New York city hall (1803–09); and various other churches and public and private buildings. In the design of the city hall he was assisted by a French refugee, Maugin.

McCOMBS, William Frank (1875–1921). An American lawyer and political leader, born at Hamburg, Ark. He graduated in 1898 from Princeton, where he became the friend and admirer of Woodrow Wilson, then president of the university. In 1901 he completed the course at Harvard Law School, thereafter practicing his profession in New York City. He was among the first to predict presidential honors for Wilson after the latter's election as Governor of New Jersey and in 1912 he made a remarkable record in directing the campaign for Wilson's nomination and election. After the Democratic success McCombs was frequently mentioned for a place in the cabinet, but instead he was offered the post of Ambassador to France. This, after hesitation, he declined. Although resuming his law practice, he continued to be political adviser of the administration, as chairman of the Democratic National Committee.

McCONNEL, m*a*-kŏn′ĕl, Francis John (1871–). An American Methodist Episcopal bishop, born at Trinway, Ohio. He graduated from Ohio Wesleyan University in 1894 and until 1902 was pastor of churches in Massachusetts, meanwhile studying at Boston University School of Theology (S.T.B., 1897). In 1902 he was called to the New York Avenue Church, Brooklyn; from 1909 to 1912 he was president of DePauw University; and in 1912 he was elected Bishop. He is the author of *The Diviner Immanence* (1906); *Religious Certainty* (1910); *Christian Focus* (1911); *The Increase of Faith* (1912); *Personal Christianity, Instruments and Ends in the Kingdom of God,* the Cole lectures (1915).

McCON′NELSVILLE. A town and the county seat of Morgan Co., Ohio, 27 miles by rail south by east of Zanesville, on the Muskingum River and on the Baltimore and Ohio Railroad (Map: Ohio, G 6). It is the centre of a farming region, and among its industrial plants are flouring mills, cigar factories, lumber mills, and the government workshops and yards for the Muskingum River improvement. Natural gas is found in the vicinity, also coal, the county being one of the greatest undeveloped coal areas in the State. The water works are owned by the town. Pop., 1900, 1825; 1910, 1831.

McCOOK′. A city and the county seat of Red Willow Co., Neb., 228 miles by rail west by south of Lincoln, on the Republican River and on the Chicago, Burlington, and Quincy Railroad (Map: Nebraska, D 4). It is a railroad division headquarters with shops and roundhouse, and is the centre of a region interested largely in the cultivation of sugar beets and alfalfa and in cattle raising. The city contains a Carnegie library and a Federal courthouse. The water works are owned by the municipality. Pop., 1900, 2445; 1910, 3765.

McCOOK, Alexander McDowell (1831–1903). An American soldier, prominent in the Civil War. He was born in Columbiana Co., Ohio, graduated at West Point in 1852, was employed for a time in garrison duty, served against the Utah and Apache Indians in 1855, and from 1858 to 1861 was assistant instructor of infantry tactics at West Point. In the last-named year he was appointed colonel of a volunteer regiment, and in this capacity served in the first battle of Bull Run, earning the brevet of major. He was promoted to be brigadier general of volunteers on September 3, commanded a brigade in the operations in Kentucky, October to December, 1861, and a division in the Army of the Ohio in the Tennessee and Mississippi campaign, February and June, 1862, and became a major general of volunteers on July 16, 1862. He led a corps under Buell in Kentucky during that officer's campaign against Bragg, and on October 8 participated in the battle of Perryville. From November to December, 1862, he was in command at Nashville, Tenn., and subsequently participated in the battles of Murfreesboro and Chickamauga; was assigned to the Middle Military Division, and from February to May, 1865, was in command of the District of Eastern Arkansas. At the close of the war he was brevetted brigadier general in the regular army for "gallant and meritorious services at the battle of Perryville" and major general for "gallant and meritorious services in the field during the Rebellion," and in March, 1867, reëntered the regular service as lieutenant colonel. He became a brigadier general in 1890 and a major general in 1894, was retired from active service in 1895, represented the United States at the coronation of the Czar in May, 1896, and from September, 1898, to February, 1899, served on a commission appointed by President McKinley to investigate the administration of the War Department during the Spanish-American War. His father and his eight brothers all served as officers in the Federal army during the Civil War, and his father and three of his brothers were killed. Consult: J. K. Hosmer, *The Appeal to Arms* (New York, 1906); id., *Outcome of the Civil War* (ib., 1906); J. F. Rhodes, *History of the United States from the Compromise of 1850,* vol. iii (ib., 1907).

McCOOK, Anson George (1835–1917). An American soldier and politician, born at Steubenville, Ohio. He crossed the plains to California in 1854, but returned six years later and was admitted to the bar. At the outbreak of the Civil War he entered the Federal army as captain of an Ohio company which he recruited himself; was at the first battle of Bull Run; and later became colonel of a regiment in the Army of the Cumberland. He participated in the battles of Perryville, Stone River, Lookout Mountain, and Missionary Ridge, and accompanied Sherman on the march through Georgia. At the close of the war he was brevetted brigadier general. In 1873 he removed to New York. He was a Republican member of Congress from 1876 to 1883, secretary of the United States Senate (1884–93), and city chamberlain of New York (1895–97).

McCOOK, Henry Christopher (1837–1911). An American theologian and entomologist, brother of A. G. McCook, born at New Lisbon, Ohio. He was educated at Jefferson College and at the Western Theological Seminary; served as lieutenant and as chaplain in the Forty-first Illinois Volunteers (1861–62); and held various pastorates, including that of the Tabernacle Presbyterian Church, Philadelphia. He was again a chaplain in the war with Spain. For long he was president of the American Entomological Society and of the American Presbyterian Historical Society. He wrote: *The Women Friends of Jesus* (1885); *The Gospel in Nature: Object and Outline Teaching* (1871); *The Latimers, a Scotch-Irish Historic Romance of the Western Insurrection* (1898); *The Senator: A Threnody* (1905), in memory of Senator Hanna; and the entomological works, *Honey Ants and Occident Ants* (1882); *Tenants of an Old Farm* (1884); *American Spiders and their Spinning Work* (1889–93); *Nature's Craftsmen: Popular Studies of Ants and Other Insects* (1907); *Ant Communities and how they are Governed* (1909).

MacCOR′MAC, Sir William, first Baronet (1836–1901). An Irish surgeon, born at Belfast. He graduated (M.A., 1858) from Queen's University in Belfast and returned to that city to practice surgery after studying in Berlin. During the Franco-Prussian War he served under the Red Cross with the French army. In 1871 he became fellow of the Royal College of Surgeons of England and assistant surgeon at St. Thomas's Hospital, London. After 1873, when he was made full surgeon, until he retired in 1893, he lectured in the Royal College of Surgeons; and in the meanwhile he was a surgeon during the Turco-Servian campaign in 1876.

During the South African War he served as government consulting surgeon to the field force (1899–1900). He was knighted in 1881; was made a baronet in 1897; and was president of the British Medical Association in 1890 and of the Hunterian Society from 1896 to 1900. He published *Notes and Recollections of an Ambulance Surgeon* (1871; Ger. trans., 1871; It. trans., 1872) and *Surgical Operations* (part i, 1885, 2d ed., 1891; part ii, 1889).

McCORMACK, John (1884–). A celebrated Irish tenor, born at Athlone. His entire training he received practically from Vincent O'Brien, the choirmaster of Dublin Cathedral, whose choir he joined in 1903. In 1905 he studied for a few months in Milan. His début as a concert singer took place in London at one of Boosey's ballad concerts in the spring of 1907, and in the fall of the same year he made his operatic début as Turiddu in *Cavalleria Rusticana* at Covent Garden. In 1909 Hammerstein brought him to America as one of the leading tenors of the Manhattan Opera House, where he at once achieved an immense popular success. The following season he was a member of the Chicago Opera Company. In 1912 he toured Australia as principal tenor of the Melba Grand Opera Company. His greatest successes were won on the concert platform by his inimitable rendition of Irish songs.

McCOR′MICK, Cyrus Hall (1809–84). An American inventor and manufacturer. He was born at Walnut Grove, Va., but removed to Cincinnati in 1845 and to Chicago in 1847. In 1831 he constructed the reaping machine which subsequently was patented and greatly improved. In 1878 at the French exposition McCormick received his third grand prize for his reaping and self-binding machine. He was also made an Officer of the Legion of Honor and a corresponding member of the French Academy of Sciences. In 1859 he contributed $100,000 to the establishment at Chicago of the Presbyterian Theological Seminary of the Northwest (later called McCormick Seminary). He also endowed a chair in Washington and Lee University, Lexington, Va.

McCORMICK, (Joseph) Medill (1877–). An American newspaper publisher and Progressive leader, a son of Robert Sanderson McCormick. He was born in Chicago; graduated at Yale in 1900; and for a time was vice president and publisher of the Chicago *Daily Tribune* and president of the City Press Association. He was prominent in the fight to secure the removal of William Lorimer (q.v.) from the Senate—a struggle which divided the Republican party in Illinois. In the contest for the presidential nomination in that party in 1912 he was the enthusiastic and consistent supporter of Theodore Roosevelt, whom he followed in the formation of the Progressive party. In 1912 he became vice chairman of the Progressive National Committee, and in the same year was a member of the committee of seven that went to Europe under the auspices of his party to study the effects of social-justice laws.

Mrs. Medill McCormick, a daughter of the late Senator M. A. Hanna, became prominent as a leader in the woman-suffrage movement. In 1914 she was appointed chairman of the committee on congressional work of the National American Woman Suffrage Association.

McCORMICK, Robert Sanderson (1849–1919). An American diplomat, father of (Joseph) Medill McCormick. He was born in Rockbridge Co., Va., and was educated at the University of Virginia. He served as Secretary of Legation in London in 1889–92; was appointed Minister to Austria-Hungary in 1901, the title being changed to Ambassador in 1902; was transferred to Russia, where he served for three years; and from 1905 to 1907 was Ambassador to France. In 1907 he was decorated with the Japanese Order of the Rising Sun (first class).

McCORMICK THEOLOGICAL SEMINARY. A divinity school of the Presbyterian church, in Chicago, opened in 1830 as the theological department of Hanover Academy at Hanover, Ind. In 1840 it was removed to New Albany, Ind., where it remained until reëstablished at Chicago in 1859 upon an offer of endowment by Cyrus H. McCormick under the name of the Presbyterian Theological Seminary of the Northwest. Its present name was assumed in 1886. The seminary charges no fees for tuition or lodging. Special funds provide assistance for needy students, and fellowships are awarded for excellence. In 1905 the seminary for the first time elected a president, and Mrs. Cyrus H. McCormick and her sons gave $1,000,000. There are 13 buildings, valued with the grounds at $548,200. The library contains upward of 40,000 volumes. In 1914 the seminary had 12 instructors, 184 students, an endowment of $1,737,467, and a gross income of $98,063. The president in 1914 was Rev. J. G. K. McClure, D.D.

McCOSH′, James (1811–94). A Scottish-American philosopher and educator. He was born in his father's farmhouse at Carskeoch in Ayrshire, April 1, 1811. At the age of 13 he was sent to Glasgow University, and went thence in 1829 to Edinburgh. In 1834 he began preaching, and not long after was settled as a minister at Arbroath. In 1839 he removed to a larger charge at Brechin. During his incumbency there he threw himself ardently into the work of helping to set up the Free Church of Scotland, as a protest against the reception of state aid by the Established Kirk, which the seceders called Erastianism. He published in 1850 *The Method of the Divine Government, Physical and Moral,* which Sir William Hamilton pronounced "worthy of the highest encomium." This book laid the foundation of his fame as a philosophical writer, and he probably owed to it his appointment in the following year to the chair of logic and metaphysics in Queen's College, Belfast, and the beginning of an educational career which was to last till the close of his active life. Called back to Scotland in 1856 to teach apologetics and theology at Glasgow, he resolutely declined, and remained at Belfast until he was invited in 1868 to assume the presidency of Princeton College. It was a critical period for American higher education. No small task was set before a foreigner, well on in middle life, who was expected to evolve a new system, to win public confidence, and to secure the endowments necessary for a work of such magnitude. It was accomplished, however, with remarkable success, as may be inferred from the fact that the number both of students and professors in Princeton College more than doubled during his administration. He resigned the presidency, owing to advancing age, in 1888, but retained the chair of philosophy, and continued to live at Princeton until his death, Nov. 16, 1894. He was an ardent defender of the Scottish philosophy against empiricism, and enlarged its scope by placing much more of our knowledge to the credit of intuition than had his predecessors. His theology was strictly on the lines of the Westminster Confession, but he was one of the first orthodox clergymen in America to accept and defend the theory of evolution in biology. Among his voluminous works may be mentioned *Typical Forms and Special Ends in Creation* (1856), in collaboration with Dr. Dickie; *Intuitions of the Mind Inductively Investigated* (1860); *The Supernatural in Relation to the Natural* (1862), which was intended to form part of a completer treatment of the method of the divine government, supernatural and spiritual; *An Examination of Mr. J. S. Mill's Philosophy* (1866); *The Scottish Philosophy, Biographical and Critical* (1874); *The Emotions* (1880); *Psychology of the Cognitive Powers* (1886); *Psychology of the Motive Powers* (1887); *Realistic Philosophy Defended* (1887). A *McCosh Bibliography* was published by J. H. Dulles (Princeton, 1895). Consult his *Life*, edited by W. M. Sloane (New York, 1896).

MacCRACK′EN, Henry Mitchell (1840–1918). An American clergyman and educator, born at Oxford, Ohio. He graduated at Miami University in 1857, was a teacher and school superintendent for four years, studied at the United Presbyterian Theological Seminary (Xenia, Ohio) and then at Princeton Seminary, and held pastorates at Columbus, Ohio (1863–67), and Toledo (1868–81). In 1867 he served as a delegate to the General Assembly of the Free Church of Scotland and while abroad studied at Tübingen and Berlin. After three years as chancellor of the Western University of Pennsylvania (now University of Pittsburgh), he was called (in 1884) to the chair of philosophy in the University of the City of New York (now New York University). Within the same year he was a delegate to the Irish Presbyterian General Assembly. In addition to his professorial duties he accepted the vice chancellorship of the university in 1885, and from 1891 to 1910 was chancellor. (For changes which occurred during his administration, see New York University.) Among his writings are: *Tercentenary of Presbyterianism* (1870); *Leaders of the Church Universal* (3 vols., 1897); *Cities and Universities* (1882); *The Scotch-Irish in America* (1884); *John Calvin* (1888); *A Metropolitan University* (1892); *Educational Progress in the United States* (1893); *The Three Essentials* (1901); *Urgent Eastern Questions* (1912).

MacCRACKEN, Henry Noble (1880–). An American college president, son of Henry Mitchell MacCracken. Born at Toledo, Ohio, he graduated A.B. from New York University in 1900 and Ph.D. from Harvard in 1907. The former gave him an honorary L.H.D. in 1915. He was instructor in English at the Syrian Protestant College, Beirut (1900–03), and at Harvard (1908–10), assistant professor at the Yale Sheffield Scientific School (1910–13), and professor of English at Smith College (1913–14). In 1914 he was elected president of Vassar. He is author of *First Year English* (1903; 2d ed., 1905); coauthor of *English Composition in Theory and Practice* (1909; 2d ed., 1912) and of *An Introduction to Shakespeare* (1910); and editor of *The College Chaucer* (1913).

MacCRACKEN, John Henry (1875–). An American college president, son of Henry Mitchell MacCracken. He was born at Rochester, Vt., and was educated at New York University (A.B., 1894; A.M., 1897), at Union Theological Seminary (1894–95), and at Halle (Ph.D., 1899). At New York University he was instructor in 1896–99 and assistant professor of philosophy in 1899, and (after four years as president of Westminster College, Missouri) syndic and professor of politics from 1903 to 1914. In the latter year he was chosen president of Lafayette College. After 1909 he served as president of the Presbyterian College Board. New York University gave him an honorary LL.D. in 1915.

McCRA′DY, Edward (1833–1903). An American lawyer, soldier, and historian, born in Charleston, S. C. He studied at Charleston College and in 1855 was admitted to the bar in his native State, where he took an active part in the secession movement and participated in the capture of Castle Pinckney and in the bombardment of Fort Sumter. After the organization of the Confederate government he entered its military service as captain of the first company raised in South Carolina (June 27, 1861) and rose to the rank of lieutenant colonel. He was wounded at the second battle of Bull Run (Aug. 30, 1862) and a few months later was so severely injured by a falling tree as to be incapacitated for further field service. After the war he became a member of the House in his State Legislature and proposed the South Carolina election and registration law, known as the Eight Box Law. His principal works are: *The History of South Carolina under the Proprietary Government, 1670–1719* (1897); *The History of South Carolina under the Royal Government, 1719–1776* (1899); *The History of South Carolina in the Revolution, 1775–1780* (1901).

McCRAE, Thomas (1870–). An American physician. Born at Guelph, Ontario, Canada, he graduated M.B. (1895) at the University of Toronto, where he had been a fellow in biology (1892–94) and where he received the degree of M.D. in 1903. McCrae did postgraduate work at Göttingen in 1899, served as associate in medicine at Johns Hopkins University in 1904–06 and as associate professor (1906–12), and then became professor of medicine at Jefferson Medical College, Philadelphia. He was associate editor of Osler's *Modern Medicine* (1907–10) and *System of Medicine* (1912); and with Osler he wrote *Cancer of the Stomach* (1910).

McCRA′RY, George Washington (1835–90). An American politician, born at Evansville, Ind. When he was about a year old his family removed to that part of Wisconsin Territory which later became the State of Iowa. He was admitted to the bar in 1856 and began to practice law at Keokuk. The next year he was elected to the State Legislature, and from 1861 until 1865 he was a member of the State Senate. From 1869 until 1877 he was a Republican member of Congress, where he served on the Committee on Revision of Laws, Naval Affairs, and Judiciary, and was chairman of the committees on Elections and on Railroads and Canals. He drew up the law under which the United States judiciary was reorganized, proposed the appointment of a joint committee to count the electoral vote at the time of the Tilden-Hayes controversy, and was largely instrumental in securing the passage of the Electoral Bill. He was Secretary of War from 1877 to 1879 and judge of the Eighth United States Judicial District in 1879–84. He published *The American Law of Elections* (1875).

McCREA, m′-krā′, Jane (c.1757–77). An

American girl, who during the Revolutionary War met her death under circumstances which have given her name a place in history. She was born at Bedminster (now Lamington), N. J.; but after the death of her father, a Scottish Presbyterian clergyman, she lived near Fort Edward, N. Y., with her brother, and in July, 1777, at the time of Burgoyne's invasion, was visiting a Mrs. McNeil at this place. Her lover, David Jones, was an officer in a Loyalist regiment, and on the morning of July 27 seems to have sent a small party of Indians (under Duluth) to escort her within the English lines, where the two were to be married. Meanwhile another party of Indians under the Wyandot Panther (or Wolf) captured her and Mrs. McNeil and was closely pursued and fired upon by a party of Americans. Mrs. McNeil arrived in safety at the English camp, and on the next day a scalp, identified as that of Jane McCrea (whose body was found soon afterward), was brought in; but the exact manner of her death was never definitely known. The Indians claimed that she was shot accidentally by the pursuing Americans, but it seems almost certain that she was killed by the Indians themselves during a dispute over her possession between Panther and Duluth. The story of her death, embellished with many romantic details, spread with wonderful rapidity and so aroused the surrounding country that volunteers poured in from all sides to assist in the operations against Burgoyne; while Burgoyne himself, shocked at the barbarity of his Indian allies, reproved them with such severity that most of them forthwith left his camp and refused further aid. Many versions of the story have appeared, all accounts, however, agreeing that the unfortunate girl was beautiful and highly accomplished and a general favorite. Consult D. Wilson, *The Life of Jane McCrea* (New York, 1853), and R. O. Bascom, *The Fort Edward Book* (Fort Edward, 1903).

McCRIE, ma-krē', Thomas (1772–1835). A Scottish divine and ecclesiastical historian, born at Duns, Berwickshire. He studied at the University of Edinburgh and was ordained minister of the Second Associate Congregation at Potterrow, Edinburgh. With other seceding ministers he formed the Constitutional Associate Presbytery in 1806. The synod, after a lawsuit, ejected him from the meetinghouse at Potterrow. Thereupon his congregation built him a new church, where he ministered until his death. His ecclesiastical troubles turned his attention to Scottish church history and led to the publication of a number of excellent works, including: *The Life of John Knox, Containing Illustrations of the History of the Reformation in Scotland* (2 vols., 1812; 4th ed., 1855); *The Life of Andrew Melville* (2 vols., 1819; 3d ed., 1856); *History of the Progress and Suppression of the Reformation in Italy* (1827; 2d ed., 1832); *History of the Progress and the Suppression of the Reformation in Spain* (1829).

McCULLOCH, m'-kŭl'lō, Benjamin (1811–62). An American soldier, born in Rutherford Co., Tenn. He left school at the age of 14 to become a hunter and river boatman, joined David Crockett (q.v.) and other adventurous frontiersmen in 1835 as a volunteer in the Texan war of independence, and served with distinction in the battle of San Jacinto. After the war he settled at Gonzales as a surveyor and in 1839 was elected a member of the Texan Congress. In 1840–41 he was engaged in fighting the Comanches and in repelling Mexican border raids. He was a member of the first Texas State Legislature and was appointed a major general of the State militia. In the Mexican War he recruited a picked force of Texan mounted rangers, served under Taylor at Monterey and Buena Vista, and later performed valuable scouting duty during Scott's advance on the Mexican capital. After a few years' residence in California he returned to Texas in 1852 and in the following year was appointed to the difficult and dangerous post of United States marshal for Texas. In 1857 he was one of the commissioners to settle the difficulties with the Mormons in Utah. At the outbreak of the Civil War he entered the Confederate service and was appointed, in May, 1861, brigadier general and placed in command of the Indian Territory. He had scarcely organized his command, when he was ordered with it into Missouri to carry out the plan of winning that State for the Confederacy. He joined General Sterling Price and with him defeated the Federal forces under Gen. Nathaniel Lyon (q.v.) at Wilson's Creek, Aug. 10, 1861. After the battle he refused to order a pursuit of the Federal troops and was superseded in the chief command by General Price. He continued in active service, however, commanded one of the Confederate wings under Gen. Earl Van Dorn (q.v.) at the battle of Pea Ridge, Ark. (q.v.), March 7–8, 1862, and was killed by a sharpshooter while reconnoitring. Consult S. C. Reid, *Scouting Expeditions of McCulloch's Rangers* (Philadelphia, 1859).

MACCULLOCH, m'-kŭl'lō, Horatio (1805–67). A Scottish landscape painter, born in Glasgow. He studied under John Knox, a Glasgow painter, and gradually developed an individual style. His sincere love for and close study of nature gave him a prominent position among Scottish landscape painters—he marks the transition from the old to the new school. While his pictures are often exaggerated in color, and wanting in atmosphere and technique, they are painted with freshness and sincerity. His subjects, all taken from Scottish, usually Highland, scenery, include: "Evening," "A Lowland River," "Inverlochy Castle" (all in the National Gallery, Scotland), "My Heart's in the Highlands," and a fine series in the Glasgow Museum. He was elected a member of the Scottish Academy in 1838. Consult Fraser, *The Works of Horatio Macculloch* (Edinburgh, 1872).

McCULLOCH, Hugh (1808–95). An American financier, born at Kennebunkport, Me. He studied at Bowdoin College, but on account of ill health did not graduate. In 1833 he removed to Fort Wayne, Ind., and entered upon the practice of law, but in 1845 he accepted the position of manager of a branch of the State Bank of Indiana and soon became one of the directors of the mother bank as well. In 1862 he was made president of the Bank of the State of Indiana, which had been just organized. In these positions he gained a more than local reputation as a skilled financier. In 1863 he was appointed Comptroller of the Currency, with supervision over the national banking system, which was called into existence by the law of that year. In March, 1865, McCulloch succeeded Fessenden as Secretary of the Treasury at the request of President Lincoln and held that position until March, 1869. Here he was confronted with the serious problems of paying off the troops and bringing order into the finances of the nation, overcharged with the issue of all kinds of obligations of indebtedness. In the former task he was highly successful; in the latter he made good progress in getting the funded indebtedness in order, but after a brief period of approval met with antagonism in Congress in his efforts to retire the legal-tender notes. McCulloch was an earnest advocate of specie resumption at the earliest possible moment. In 1869 he retired from the Treasury, became a member of the firm of Jay Cooke, McCulloch & Co., London, and engaged in banking in that city. He was reappointed Secretary of the Treasury upon the retirement of Secretary Gresham in October, 1884, and held that office until 1885. He died in 1895. He was the author of a pleasing book of recollections, entitled *Men and Measures of Half a Century.*

McCULLOCH, Sir James (1819–93). An Australian statesman, born at Glasgow, Scotland. In 1853 he opened a branch for Dennistoun & Co. (later McCulloch, Sellar & Co.) at Melbourne, Victoria, and in the following year he was elected nominee member of the Victoria Legislature. In 1857–58 he was Minister of Trade and Customs. His premiership, from 1863 to 1868, was marked by a bitter struggle with the Council of the colony over the tariff and subsequently over a grant of £20,000 to Sir Charles Darling, the Governor of Victoria. After being a few months out of office, he became Premier again in 1868, but resigned in the following year. The same office he held a third time in 1870–71, and a fourth in 1875–77. During this latter period he introduced his famous closure rule to meet the obstructionist tactics of his opponents. He was knighted in 1869.

MACCULLOCH, John (1773–1835). An eminent geologist, of Scottish family, though born in Guernsey. He studied medicine in Edinburgh and was appointed assistant surgeon to an artillery regiment. He became chemist to the Board of Ordnance in 1803 and for some time practiced medicine. In 1811, employed by the government, he devoted himself to a pioneer geological and mineralogical exploration of Scotland. The brilliant results of his labors appeared in *A Description of the Western Isles of Scotland* (2 vols., 1819); *Highlands and Western Isles of Scotland* (4 vols., 1824); *A System of Geology* (2 vols., 1831); *Geological Map of Scotland,* with an explanatory volume (1836). His scientific work has well earned for him a conspicuous position in the history of British geology. He was chiefly interested in petrography and mineralogy and appears to have been irritated by the increasing prominence of paleontological geology.

MacCULLOCH, J(ohn) A(rnott) (1868–). A Scottish clergyman. He was born at Edinburgh, was educated there at the Merchant Company's School and the Theological College, was ordained in 1891, became vice principal of the Theological College in 1895, and was rector of St. Columba's, Portree, in 1897–1911, and then rector of St. Saviour's, Bridge of Allan. In 1912–14 he was Bell lecturer in the Edinburgh Theological College. He contributed to Hastings, *Encyclopædia of Religion and Ethics,* and wrote: *Comparative Theology* (1902); *Religion: Its Origin and Forms* (1904); *The Misty Isle of Skye* (1905); *The Childhood of Fiction* (1905); *The Religion of the Ancient Celts* (1911); *Early Christian Visions of the Other World* (1912).

McCULLOCH, John Ramsey (1789–1864). A British economist and statistician. He was educated at Edinburgh, with a view to fitting himself for the legal profession, and entered the office of a solicitor; but, finding the work distasteful to him, he devoted himself to the study of economics. His first publication, *An Essay on a Reduction of the Interest of the National Debt,* appeared in 1816. From 1817 to 1827 he contributed numerous articles on economics to the *Scotsman,* a periodical which had recently been founded in the interests of liberalism. In 1818 he began to write for the *Edinburgh Review* and for 20 years contributed almost all of the articles on economic subjects that appeared in that periodical. In 1824–25 appeared his first important work, *A Discourse on the Rise, Progress, Peculiar Objects, and Importance of Political Economy.* In 1825 he published his *Principles of Political Economy.* In the following year he published an *Essay on the Circumstances which Determine the Rate of Wages and the Condition of the Laboring Classes,* a work which is of great importance in the history of the Wage Fund Theory. In 1828 McCulloch was appointed to the chair of political economy in University College, London, but he found the position unsatisfactory and resigned in 1832. In 1831 he published a work on the *Principles, Practice, and History of Commerce,* which had great influence in popularizing the doctrines of free trade. The following year what is perhaps his greatest work appeared, *A Dictionary, Practical, Theoretical, and Historical, of Commerce and Commercial Navigation.* In 1838 he was appointed Comptroller of the Stationery Office, a position which he held until his death. In 1845 appeared his *Treatise on the Principles and Practical Influence of Taxation and the Funding System,* a work once regarded as of great importance in the science of finance. He also edited a large number of pamphlets of early writers in economics, thus giving a great impulse to the study of the history of the science. He also published copiously annotated editions of Adam Smith and Ricardo. From the death of Ricardo until the rise of Mill to fame, McCulloch was the predominant personality of English economics. His work was not always accurate and never original; but he did more than any writer of his time to create a popular interest in economics; by his dogmatism, however, and the harshness with which he asserted the superiority of economic law to well-meant political institutions, he aroused among more humanitarian thinkers an intense dislike for economic science. Consult biographical notice by H. G. Reid in McCulloch's *Dictionary of Commerce and Commercial Navigation* (London, 1869–71), and R. H. I. Palgrave, *Dictionary of Political Economy* (New York, 1910).

McCULLOUGH, m'-kŭl′lô, John Edward (1837–85). An American tragedian, born at Blakes, Londonderry, Ireland. He came to the United States from Ireland in 1853 and first appeared on the stage in a minor part at the Arch Street Theatre, Philadelphia, in 1857. In 1866–68 he traveled with Edwin Forrest, whose methods he imitated. In 1881 McCullough appeared for a month's run in the parts of Othello and Virginius, at Drury Lane, London, but failed to make a favorable impression on his English audiences. He took many notable rôles, including Laertes, Iago, Edgar, Macduff, Richmond, Cominius (to Forrest's Coriolanus), Pythias (to Forrest's Damon), Hamlet, and Richelieu. His chief part, however, was Virginius. His interpretations were of the heroic type. Consult Clark, *John McCullough as Man, Actor, and Spirit* (Boston, 1905).

McCULLOUGH, Myrtle Reed. See Reed.

McCUM′BER, Porter James (1858–). An American legislator, born at Crete, Will Co., Ill. He graduated in law from the University of Michigan in 1880 and in the following year became senior member of the law firm of McCumber and Bogart at Wahpeton, N. Dak. A Republican in politics, he was a member of the Territorial House of Representatives in 1885–89, and, after North Dakota was admitted to the Union, he was State's attorney for Richland County in 1896–97. McCumber was elected to the United States Senate in 1898 and was reëlected in 1904 and 1910. He was chairman first of the Committee on Manufactures, and later, throughout the Taft administration, of the Committee on Pensions, and was, besides, a member of various other committees.

MacCUNN′, Hamish (1868–1916). A Scottish composer, born in Greenock. He studied at the Royal College of Music, London, and under Hubert Parry. He was introduced to the musical world in 1887 by August Manns and the next year became professor of harmony at the Royal Academy of Music. In 1892 he was conductor of the Hampstead Conservatory Orchestra Society. In 1894 he resigned his professorship. At various times he was conductor with the Carl Rosa and Moody Manners Opera companies, and of light operas at a number of London theatres. In 1913–14 he was conductor of the Stock Exchange Orchestra. His compositions include the operas *Jeanie Deans* (1894), *Diarmid and Ghriné* (1897); the cantatas, *Bonnie Kilmeny* (1888), *Lord Ullin's Daughter* (1888), *The Lay of the Last Minstrel* (1888), *The Cameronian's Dream* (1892), *The Death of Parry Reed, The Wreck of the Hesperus* (1905); the orchestral overtures, *The Land of the Mountain and the Flood, Coir Mohr, The Dowie Dens o' Yarrow.*

MacCUR′DY, George Grant (1863–). An American anthropologist, born at Warrensburg, Mo., where he graduated from the State Normal School in 1887. He then studied at Harvard University (A.B., 1893; A.M., 1894), at Vienna, Paris (School of Anthropology), and Berlin in 1894–98, and at Yale (Ph.D., 1905), where he was instructor in anthropology (1898–1900), lecturer and curator of the anthropological collections (1902–10), and assistant professor of archæology after 1910. He served as vice president of the American Association for the Advancement of Science in 1905. Besides many special contributions on anthropology, he is author of *The Eolithic Problem* (1905); *Some Phases of Prehistoric Archæology* (1907); *Recent Discoveries Bearing on the Antiquity of Man in Europe* (1910); *A Study of Chiriquian Antiquities* (1911); *Human Skulls from Gazelle Peninsula* (1914).

McCURDY, James Frederick (1847–). A Canadian Orientalist, born at Chatham, New Brunswick. He was educated at the University of New Brunswick, under William Henry Green at the Princeton Theological Seminary, where he was instructor in, and, later, assistant professor of, Semitic languages (1873–82), and at Göttingen and Leipzig (1882–84), was Stone lecturer at Princeton (1885–86), and from 1888 to his retirement in 1914 was professor of Oriental languages in the University of Toronto. He was appointed to take charge of the School of Oriental Research, Jerusalem, for 1911–12, and in 1913 he was visiting professor at the University of Chicago. For the American edition of Lange's *Commentary* he translated and edited the parts dealing with the Psalms and Hosea and himself wrote the commentary on Haggai (1872–74). His other works include: *Aryo-Semitic Speech* (1881); "The Semitic Perfect in Assyrian," in the *Proceedings of the Sixth Oriental Congress* (1885); *History, Prophecy, and the Monuments* (1894–1901); *The Life and Work of the Rev. D. J. Macdonnell* (1897).

McCURDY, Richard Aldrich (1835–1916). An American insurance official, born in New York City. He graduated at Harvard Law School in 1856 and in 1860 entered the employ of the Mutual Life Insurance Company of New York as attorney. In 1865 he became vice president of the company and from 1885 to 1906 was president. In 1905 the legislative investigation of his company brought to light such extravagance and mismanagement that his resignation was demanded. One of the serious abuses under his management of the company was the voting of excessively high salaries to himself ($150,000 a year) and to his relatives and friends.

McCUTCHEON, ma-kŭch′ŭn, George Barr (1866–). An American novelist, born on a farm in Tippecanoe Co., Ind. He was educated at Purdue University and later became a reporter on the Lafayette (Ind.) *Journal* (1889) and city editor of the Lafayette *Courier* (1893). His long list of stories, whose romantic character has made them very popular, includes: *Graustark* (1901); *Brewster's Millions* (1903); *Beverly of Graustark* (1904); *The Husbands of Edith* (1908); *The Rose in the Ring* (1910); *What's-his-Name* (1911); *Mary Midthorne* (1911); *Her Weight in Gold* (1912); *The Hollow of her Hand* (1912); *A Fool and his Money* (1913); *The Prince of Graustark* (1914).

McDANIEL, mak-dăn′yel, Henry Dickerson (1837–). An American public official, born at Monroe, Ga. He graduated from Mercer University in 1856 and was admitted to the bar, was a member of the Secession Convention of Georgia in 1861, and on the outbreak of the Civil War entered the Confederate army, in which he rose to the rank of major in the Eleventh Georgia Infantry. In 1865 he was a member of the State Constitutional Convention, in 1873–74 served in the State House of Representatives and in 1874–83 in the State Senate, and from 1883 to 1886 was Democratic Governor of Georgia.

McDANIEL, Walton Brooks (1871–). An American Latin scholar, born at Cambridge, Mass. He graduated from Harvard in 1893 and took the degree of Ph.D. in 1899, during part of the interval having served as assistant in Latin and Greek (1896–97). From 1899 to 1901 he was an instructor at Harvard and in 1900–01 an instructor also at Radcliffe. In 1909 he was called to the chair of Latin at the University of Pennsylvania. McDaniel contributed many valuable articles to American and foreign philological journals and became associate editor of the *Classical Weekly*.

McDONALD, mak-dŏn′ald. A borough in Washington Co., Pa., 18 miles by rail southwest of Pittsburgh, on the Pittsburgh, Cincinnati, Chicago, and St. Louis Railroad (Map: Pennsylvania, A 6). There are manufactories of bottles, oil-well drilling tools, flour-mill products, etc. Oil and coal are produced extensively in the surrounding region. Pop., 1900, 2475; 1910, 2543.

MACDONALD, Andrew Archibald (1829–1912). A Canadian statesman. He was born at Three Rivers, Prince Edward Island, and was educated at the county grammar school and privately. He early became a merchant and later a shipowner. Entering political life, he was a Conservative member of the Provincial Legislative Assembly (1854–62) and in 1863 was elected to the Legislative Council, where he was opposition leader and afterward government leader. He was a delegate to the Charlottetown and Quebec conferences (1864), where the fundamental terms of confederation were agreed upon. He was a member of the Provincial Executive Council (1867–72 and again, 1872–73); Lieutenant Governor (1884–89), and was called to the Dominion Senate in 1891. He was in 1892 made a public trustee under the Land Purchase Act, which gave free lands to the tenantry of the province. See Prince Edward Island, *History*.

MacDONALD, Arthur (1856–). An American criminologist, born at Caledonia, N. Y. He graduated from the University of Rochester in 1879, attended Princeton Theological Seminary in 1880, graduated from Union Seminary in 1883, took postgraduate work at Harvard in 1883–85, and studied medicine and criminology at Berlin, Leipzig, Paris, Zurich, and Vienna between 1885 and 1889. He was docent in criminology at Clark University in 1889–91 and for the United States Bureau of Education made investigations of prisons and asylums in the United States and Europe (1892–1904). He was honorary president of the Third International Congress of the Criminal Anthropology of Europe. His writings include: *Abnormal Man* (1893); *Criminology* (1892; 2d ed., 1893); *Le Criminel-Type* (1895); *Girls who Answer Personals* (1895; 2d ed., 1897); *Education and Patho-Social Studies* (1896); *Emile Zola* (1898; 5th ed., 1901); *Experimental Study of Children* (1899); *A Plan for the Study of Man* (1902); *Statistics of Crime, Suicide, and Insanity* (1903); *Man and Abnormal Man* (1905); *Juvenile Crime and Reformation* (1908); *Mentality of Nations and Social Pathology* (1912); *Bibliography of Exceptional Children and their Education* (1913).

MACDONALD, Charles (1837–). An American civil engineer and bridge contractor. He was born at Gananoque, Ontario, Jan. 26, 1837, and studied at Queen's University, Kingston. Desiring to be an engineer, he worked for a while at surveying on the Grand Trunk Railway, but on the advice of his chief, Sir Samuel Keefer, that he obtain a technical education, he entered (1853) Rensselaer Polytechnic Institute, at Troy, N. Y., the only American engineering school then in existence. Graduating in 1857, he returned to the Grand Trunk, which was then being extended from Sarnia, Ontario, to Detroit, Mich. After that work was completed he was in the employ of the Philadelphia and Reading Railroad from 1863 to 1868, except for a brief enlistment with other railroad men to resist a threatened invasion of Pennsylvania by General Lee. During this experience he was captured at Gettysburg, but was soon released. While engaged on the Reading, he began his real life work as a bridge builder by taking part in the construction of a bridge over the Schuylkill River. This done, he entered into partnership with A. B. Burton, an experienced bridge constructor. In 1866 Macdonald and Burton secured the contract for building all the bridges between Hoboken and Dover, N. J., on what is now the Boonton Branch of the Delaware and Lackawanna Railroad. In 1872 Macdonald designed and secured the contract for Point Bridge, at Providence, R. I., a draw span of 250 feet. Soon afterward the Delaware Bridge Company was organized with Macdonald as president. Among other bridges the company built one over the Susquehanna River, at Harrisburg, for the Pennsylvania Railroad. In 1884 Macdonald and the Delaware Bridge Company united with several other eminent engineers, including Thomas C. Clarke, in the formation of the Union Bridge Company, with headquarters in New York City. This company built many notable long-span bridges, including the Poughkeepsie Bridge over the Hudson (New York), the Merchants' Bridge (St. Louis), and the Hawkesbury Bridge (Australia). The contract for the latter bridge was won in a world-wide competition, the award having been made by a commission of engineers headed by Sir Benjamin Baker (q.v.). Difficulties experienced with the foundations for this bridge led Macdonald to start on a half day's notice for Australia, where he spent a year and brought the work "to a successful and profitable conclusion." In 1900, all the other partners having previously withdrawn, Macdonald merged the Union Bridge Company with the American Bridge Company, which in turn soon became one of the properties of the United States Steel Corporation. In 1908–09 he was president of the American Society of Civil Engineers. Of the two colleges at which he studied, Queen's University gave him the degree of LL.D. in 1894, and the Rensselaer Polytechnic Institute made him a trustee.

MACDONALD, Duncan Black (1863–). An American Orientalist, born in Glasgow, Scotland. He graduated M.A. in 1885 and B.D. in 1888 from the University of Glasgow and studied at Berlin in 1890–91 and 1893. In 1892 he came to the United States, where he was thereafter professor of Semitic languages at the Hartford (Conn.) Theological Seminary. At this seminary he was also Lamson lecturer, on Mohammedanism, in 1909, and he lectured at the University of Chicago (1906), at Wellesley (1907 and 1909), at the Episcopal Theological School, Cambridge (1912), and at Oberlin (1914). He became head of the Mohammedan department of the Kennedy School of Missions at Hartford. In 1907–08 he traveled in Egypt, Syria, and Turkey, and in 1910 discovered in the Bodleian Library, Oxford, the only Oriental manuscript known of the "Story of Ali Baba and the Forty Thieves" (published in the *Journal* of the Royal Asiatic Society). His writings include: *Development of Muslim Theology, Jurisprudence, and Constitutional Theory* (1903); *Selections from Ibn Khaldun* (1905); *The Religious Attitude and Life in Islam* (1909); *Aspects of Islam* (1911).

MACDONALD, mȧk'dō'nȧl', Etienne Jacques Joseph Alexandre, Duke of Taranto (1765–1840). A marshal and peer of France. He was born at Sedan of a Scottish family, entered the army in 1785, embraced the cause of the Revolution, served under Dumouriez and Pichegru, and became general of division in 1796. In 1798 he was Governor of the Roman Republic and stirred up a revolution in Naples and founded the Parthenopean Republic (q.v.). In 1799 he was defeated at Trebbia by an overwhelming force under Suvorov, redeeming himself, however, in 1800 and 1801 by his bold march through Switzerland. Though he had aided Napoleon in the coup d'état of the Eighteenth Brumaire, he lost the favor of the First Consul in 1804 through the sympathy he displayed for Moreau (q.v.). Restored to favor in 1809, he commanded under Eugène Beauharnais, took Laibach, won the battle of the Raab, and with Lauriston (q.v.) broke the Austrian centre at Wagram, gaining the titles of Duke and marshal. He fought in Spain in 1810, in Russia in 1812, at Lützen and Bautzen in 1813, was crushed by Blücher at the Katzbach, and in the same year led the rear guard in the retreat from Leipzig. He shared in the campaign of 1814 in France. The Bourbons made him a peer, and he remained faithful to them during the Hundred Days, for which, after the Second Restoration, he was loaded with honors and gifts. The *Souvenirs du maréchal Macdonald, duc de Tarente* were published at Paris in 1892.

MACDONALD, mak-dŏn'ald, FLORA (1722–90). A Scottish heroine. She was born at Milton in the island of South Uist, one of the Hebrides. When the Pretender, Charles Edward Stuart, after the battle of Culloden in 1746, fled and was pursued by the King's troops, he was rescued by the exertions of Flora and, disguised as her female servant, was conducted by her to the Isle of Skye. When the act of Flora became known, she was arrested, and, after being kept five months on various vessels of war, she was sent to London, but was soon discharged under the Indemnity Act of 1747. In 1750 she returned to Scotland and was married to Allan Macdonald, of Kingsburgh. They emigrated to America in 1774 and settled in Fayetteville, N. C. In the Revolutionary War Macdonald served in the British army as brigadier general. Flora returned to Europe alone. Her husband, after capture and imprisonment at Halifax, Va., rejoined her in Scotland. Consult: C. D. Yonge, *The Seven Heroines of Christendom* (London, 1879); Alexander Macgregor (afterward MacKenzie), *Flora Macdonald and her Adventures with Prince Charles* (Inverness, 1882); William Jolly, *Flora Macdonald in Uist* (Perth, 1886); J. P. MacLean, *Flora Macdonald in America* (Lumberton, N. C., 1909).

MACDONALD, FREDERICK WILLIAM (1842–). An English Wesleyan clergyman, born in Leeds. He graduated from Owens College, Manchester, in 1862, and, entering the ministry, became a member of the Legal Hundred in 1881. From 1881 to 1890 he was professor of systematic theology in Handsworth College, near Manchester, from 1891 to 1904 was one of the secretaries of the Wesleyan Methodist Missionary Society (afterward honorary secretary), in 1880 was fraternal delegate from the Wesleyan Church to the General Conference of the Methodist Episcopal Church, and in 1899 was elected president of the Wesleyan conference. He visited the churches of Australia and New Zealand in 1903. He is the author of *A Memorial Sketch of the Late Rev. David Hay* (1877); *The Dogmatic Principle in Relation to Christian Belief* (Fernley Lecture, 1881); *The Life of Fletcher of Madeley* (1885); *The Life of William Morley Punshon* (1887; 3d ed., 1888); *Latin Hymns in the Wesleyan Hymnbook* (1900); *In a Nook with a Book* (1907); *The Letters of James Macdonald* (1907); *Recreations of a Book Lover* (1911); *The Shining Hour* (1911); *Recollections of my Early Ministry* (1912).

MACDONALD, GEORGE (1824–1905). A Scottish novelist, born at Huntley, Aberdeenshire, and educated at Aberdeen University. He studied for the ministry at the Independent College, Highbury, London; preached at Arundel in Sussex and at Manchester, but retired from the ministry owing to ill health. In 1872–73 he visited the United States on a lecturing tour. He began his literary career as poet, publishing volumes of poems in 1856, 1857, and 1858. His later verse comprises *The Gifts of the Child Christ and Other Poems* (1882) and *Rampolli*, translations from the German (1897). In 1862 appeared *David Elginbrod*, a novel in the dialect of Aberdeen, which was followed by *The Portent* (1864); *Alec Forbes of Howglen* (1865); *Annals of a Quiet Neighbourhood* (1866); *The Seaboard Parish* (1868); *Robert Falconer* (1868); *Wilfrid Cumbermede* (1871); *Malcolm* (1874); *Thomas Wingfold, Curate* (1876); *The Marquis of Lossie* (1877); *Sir Gibbie* (1879); *What's Mine's Mine* (1886); *Lilith* (1895); *Salted with Fire* (1897), and several others. These Scottish novels, rather poorly constructed but excellent in tone, were widely popular. They are historically the connecting link between John Galt (q.v.) and the school of J. M. Barrie (q.v.). Macdonald also wrote several books especially for the young, as *Dealings with the Fairies* (1867); *At the Back of the North Wind* (1870); *The Princess and the Goblin* (1871); *The Light Princess* (1905). Among his religious works are *Unspoken Sermons* (1866–69) and *The Miracles of Our Lord* (1870).

MACDONALD, SIR HECTOR ARCHIBALD (1853–1903). A British general, born in Ross-shire, Scotland, the son of a laboring man. He enlisted in the Ninety-second Gordon Highlanders in 1870, served nine years in the ranks, and in 1880 for bravery in the Afghan War was gazetted second lieutenant. He served in the Kabul and Kandahar campaign, in the Boer War of 1881 (the Boers released him after the battle of Majuba Hill, in admiration of his bravery), and distinguished himself at Suakin in 1888 and in the Nile campaign of 1889. In 1897, after commanding a brigade in the Dongola expeditionary force, he was put at the head of the Egyptian Brigade and took a prominent part at Abu-Hamed, at Atbara, and at Khartum. He was appointed aid-de-camp to the Queen and after Magersfontein was ordered from the Sirhind District in India to the command of the Highland Brigade, which he successfully reorganized. Macdonald was promoted K.C.B. in 1900 and was a member of the Distinguished Service Order. Transferred in 1902 from the southern and Belgaum District in India to Ceylon, he was suddenly summoned home to meet a charge of improper conduct and committed suicide in a Paris hotel on March 25, 1903. Consult T. F. G. Coates, *Hector Macdonald* (London, 1900).

MACDONALD, SIR HUGH JOHN (1850–). A Canadian lawyer and statesman. The second son of Sir John A. Macdonald (q.v.), he was born at Kingston, Ontario, and was educated at Toronto University. He was called to the bar in 1872 and practiced his profession first in Toronto (1872–82) and afterward in Winnipeg. He was a Conservative member of the House of Commons for Winnipeg (1891–93 and, again, 1896–97), Minister of the Interior in the administration of Sir Charles Tupper (1896), was elected Conservative leader in Manitoba (1899), and became Premier and Attorney-General of Manitoba in 1900. The same year he resigned in order to reënter Dominion politics, but was defeated in an election contest and retired to private life. He served during the Fenian Raid (1866), the Red River Expedition (1870), and as captain of the Ninetieth Regiment in the Northwest Rebellion (1885).

McDONALD, HUNTER (1860–). An American civil engineer, born at Winchester, Va. He attended Washington and Lee University for one year, was engaged in engineering work for the Louisville and Nashville Railway in 1879, and then became assistant engineer of the Nashville, Chattanooga, and St. Louis Railway, of which he was appointed chief engineer in 1892. He served as president of the Engineering Association of the South, of the American Railway Engineering Association (1904–06), and of the American Society of Civil Engineers (1914).

McDONALD, JAMES (1803–49). An American physician. He was born at White Plains, N. Y., and graduated at the College of Physicians and Surgeons (New York City) in 1825. From this year to 1837 he was resident physician of Bloomingdale Insane Asylum, except that he spent the year 1831 in Europe. In 1841 he opened a private insane asylum in Flushing, L. I. McDonald's lectures on mental diseases delivered at the College of Physicians and Surgeons were the first ever given in the United States. He was the author of *Reports on the Condition of the Blackwell's Island Asylum* (1835); *Construction and Management of Insane Hospitals* (1837); *Puerperal Insanity* (1845).

McDONALD, JAMES (1828–1912). A Canadian statesman and jurist, born at East River, Nova Scotia, educated at New Glasgow, and called to the bar in 1851. He was a Conservative member of the Nova Scotia Legislature (1859–67) and of the House of Commons (1872–74 and, again, 1878–81), Minister of Justice (1878–81), and Chief Justice of Nova Scotia from 1881 to 1904, when he retired on a pension. When the Reciprocity Treaty between the United States and Canada was abrogated in 1865–66, Macdonald was one of the Commissioners appointed to arrange trade relations between Canada and the West Indies, Mexico, and Brazil. He was Chief Railway Commissioner of Nova Scotia in 1863–64 and on several occasions acted as administrator of the government in that province.

MACDONALD, JAMES ALEXANDER (1858–). A Canadian jurist. He was born in Huron Co., Ontario, graduated at Toronto University, studied law, and was called to the bar in 1890. He practiced his profession first in Toronto (1890–96) and afterward at Rossland, British Columbia (1896–1909). He was a Liberal member of the Provincial Legislature and also leader of the Liberal party in British Columbia from 1903 to 1909, and in the latter year was appointed Chief Justice of the Court of Appeal, British Columbia.

MACDONALD, JAMES ALEXANDER (1862–). A Canadian clergyman and journalist. He was born in Middlesex Co., Ontario, and was educated at Edinburgh University and at Knox College, Toronto. He was ordained a Presbyterian minister in 1891, was pastor of Knox Church, St. Thomas (1891–96), and in 1896 removed to Toronto and became editor of the *Westminster*, a religious monthly. Afterward he was appointed editor of the *Presbyterian*, a weekly religious journal in which four Presbyterian papers had been merged. He was principal of the Presbyterian Ladies' College in 1896–1901 and in 1902 became editor in chief of the Toronto *Daily Globe*. He was one of the founders of the Canadian Authors' Club (1899), a promoter of the Canadian Associated Press (1904), a member of the Presbyterian committee on union of the Presbyterian, Methodist, and Congregational churches of Canada, a delegate to the Imperial Press Conference (1909), a vice president of the Institute of Journalists, England (1911), and a director of the World's Peace Conference (1911), an organization to promote international arbitration. Macdonald became widely known, not only as an editorial writer and a preacher, but as an orator of the religious and political platform, and delivered a number of notable speeches and lectures in Canada and the United States. He edited *From Far Formosa*, by Dr. G. L. Mackay (1895), and a *Memorial Volume* to Principal Caven of Knox College (1908), and published *What a Newspaper Man Saw in Britain* (1911).

MACDONALD, JAMES RAMSAY (1866–). A British leader of the Labor party, born at Lossiemouth, Scotland, and educated at a board school. From 1900 to 1911 he was secretary, and then leader, of the British Labor party, having been chairman of the Independent Labor party from 1906 (when he became Member of Parliament for Leicester) to 1909. Macdonald visited South Africa for the *Echo* in 1902 and "tariff-ridden Germany" for the *Daily News* in 1910. He aided the government in the settlement of the English railway strike of 1911. In 1912 he was a member of the Royal Commission on the public service of India. Editor of the Socialist Library (1905), he edited the sociological study of *Women in the Printing Trades* (1904); wrote the introduction to Adelheid Popp's *Autobiography of a Working Woman* (1912) and to Mookerji Radhakumud's *Fundamental Unity of India* (1914); and published *Socialism and Society* (1905), *Socialism and Government* (1909), *Syndicalism* (1912), an attack from the point of view of a trade-unionist, and *The Social Unrest: Its Cause and Solution* (1913).

MacDONALD, JAMES WILSON ALEXANDER (1824–1908). An American sculptor, born in Steubenville, Ohio. He studied in St. Louis under Waugh and in New York City in 1849. His first ideal works were "Joan of Arc" and "Italia." But he is best known for his portrait statues, including those of Edward Bates (1876), in Forest Park, St. Louis; of Fitz-Greene Halleck, in Central Park, New York (1877); of General Custer, at West Point; and he also made busts of Washington (Prospect Park, Brooklyn), Bryant, Cooper, and Weed. He prepared other busts of Washington from Houdon's original model, which he owned. He was a writer and lecturer on art and also painted landscapes and portraits.

MACDONALD, SIR JOHN ALEXANDER (1815–91). A Canadian statesman. He was born in Glasgow, Scotland, Jan. 11, 1815. In childhood brought by his parents to Upper Canada, he was educated at the Royal Grammar School, Kingston, studied law, and was called to the bar in 1836. He was elected a Conservative member of the Legislative Assembly in 1844 and was appointed Receiver-General, and later Commissioner of Crownlands, in 1847, resigning office on the defeat of his party in 1848. The manifesto in favor of annexation to the United States, which was signed by a number of prominent Montreal citizens in 1849, gave rise to a counteracting movement, and the British-American League was soon organized on a basis which Macdonald heartily accepted, and which subsequently guided his policy—the maintenance of British connection, the advocacy of a union of the British North American colonies, and support of protection to home industries. He clearly saw that, under the difficult conditions of Canadian politics, these essential articles of his political faith could not be carried into effect unless the Conservative party were liberalized and made an instrument of compromise. In 1854 he was given the portfolio of Attorney-General in a coalition cabinet of which Sir Allan MacNab (q.v.) was head of the Conservative, and A. N. Morin (q.v.) was head of the Liberal section; but while he conciliated Liberals by settling the questions of the clergy reserves and seignorial tenure (see Canada, *History;* Quebec, *History*), he was careful also to discard reactionary Tories, so that he might build a Liberal-Conservative party. He clearly recognized the necessity of watchful conciliation in governing a population specially liable to racial and religious strife, and he became perforce a resourceful though patriotic opportunist. In 1856 MacNab, a Tory of the old school, resigned, and in the succeeding administration Macdonald was again virtual head and led the Conservatives of Upper Canada. He was made Premier in 1857 and with the exception of a very brief period remained in office until 1862, when the administration was defeated on its militia bill. The short-lived ministries of the next two years pointed to the approaching breakdown of the legislative union of 1841.

Political deadlock of the two provinces turned the thoughts of leaders to a larger Canada wherein cherished provincial rights and irrepressible provincial prejudices could be assigned a safe constitutional place. The Civil War, then nearing its close, likewise imparted its lesson of firm unity to the scattered British North American provinces. Accordingly Macdonald, in entering the cabinet of Sir E. P. Taché in 1864 as Attorney-General, again resorted to compromise as a way of political escape and a means of constructive statesmanship. Fortunately a leader of equal abilities and eminence on the Liberal side was ready to meet him. In 1864 George Brown (q.v.), who on this occasion renounced his strongest political antagonism and a personal dislike of Macdonald, joined hands with the Conservative leader in a coalition to effect a union of the provinces. Macdonald at first favored a legislative union, but French-Canadian demands were opposed to it, and he deferred to the advocates of a federation. Upon the establishment of the Dominion of Canada in 1867, he became its first Premier (1867–72) and formed another coalition ministry designed to recognize the joint contribution of both parties to the founding of the new nation. He undertook the construction of the Intercolonial and the Canadian Pacific railways, was one of the British commissioners at Washington in 1870 to settle the Alabama Claims and the fisheries question, and in 1871 was one of the signers of the Washington Treaty (q.v.). But when his negotiations with Canadian Pacific Railway contractors were found to be tainted by the receipt from them of large sums of money for corrupt political uses, he was compelled to resign office (1873). During the next five years a severe industrial depression gave him the opportunity of offering a protective tariff as a remedy, and he was returned to power as Premier in 1878. He established the new tariff, popularly called the National Policy, in 1879, completed the Canadian Pacific Railway in 1885, and remained Premier until his death. Strongly opposed to the aggressive assertion of provincial rights, he was nevertheless defeated by Sir Oliver Mowat, (q.v.), Premier of Ontario, in all the legal contests in which that question was at issue. The last successful appeal in his public life was for support in defeating a Liberal programme of trade reciprocity with the United States. Macdonald was a consummate party leader, of striking appearance and great personal magnetism. His thirst for political power, together with his insight into human nature, especially on its weaker side, made him an adroit manager of men, whether in electoral masses or administrative combinations. An adept in winning popularity, he was shrewd, and sometimes not too scrupulous, in his political use of it. He had many lasting friendships and an ability for astute conciliation which quickly disarmed some opponents and subtly neutralized the efforts of others. Although not an eminent orator, he was a parliamentarian of rare skill and, except in the Canadian Pacific crisis of 1873, dominated the important occasions on which his policy met the test of debate. He married first, in 1843, his cousin, Isabella Clark; and secondly, in 1867, Susan Agnes Bernard, who was later created Baroness Macdonald of Earnscliffe. His death took place at Earnscliffe Hall, Ottawa, June 6, 1891. Macdonald received honorary degrees from several universities. He was made K.C.B. (1867), an Imperial Privy Councilor (1872), and G.C.B. (1884).

Bibliography. E. B. Biggar, *Anecdotal Life of Sir John Macdonald* (Montreal, 1891); J. E. Collins, *Life and Career of Sir John A. Macdonald* (Toronto, 1891); C. J. P. Macpherson, *Life of Sir John A. Macdonald* (ib., 1892); Sir Joseph Pope, *Memoirs of Sir John Alexander Macdonald* (London, 1894); G. R. Parkin, *Sir John A. Macdonald* in "The Makers of Canada Series" (Toronto, 1908).

MACDONALD, John Sandfield (1812–72). A Canadian statesman, born at St. Raphaels, Glengarry, Ontario. He studied law, was admitted to the bar in 1840 and practiced his profession in Cornwall. He was elected a Conservative member of the Canadian Legislative Assembly in 1841 and remained a member for 10 years. Though originally elected as a Conservative, Macdonald soon gave signs of the political independence which marked his subsequent career, and in 1849–51 he was Solicitor-General for Upper Canada in the Liberal Lafontaine-Baldwin administration. In 1852–54 he was Speaker of the Legislative Assembly, and in 1858 he was Attorney-General for Upper Canada in the Brown-Dorion administration. Although acting thus far with the Liberals, he nevertheless differed from them in opposing representation by population. In 1862–64 he became Premier in the Macdonald-Sicotte administration, which afterward, through the retirement of Sicotte, became the Macdonald-Dorion administration. He did not support the movement for confederation, though he loyally accepted it after 1867. He was the first Premier of the Province of Ontario (1867–71).

McDONALD, Joseph Ewing (1819–91). An American politician. He was born in Butler Co., Ohio, and was educated at Wabash College, Crawfordsville, Ind., and at Asbury (now De Pauw) University. He was admitted to the bar in 1844, and in the following year established himself in practice in Crawfordsville, where from 1845 to 1847 he was county prosecuting attorney. In 1848 he was elected to Congress as a Democrat, but in 1850 was defeated for reëlection. He was Attorney-General of Indiana from 1856 to 1860 and afterward practiced privately in Indianapolis. In 1864 he was the Democratic candidate for Governor, but was defeated by Oliver P. Morton. In 1872 he became chairman of the Democratic State Committee, and his efforts in this capacity resulted in the choice of a Democratic Legislature, which in 1875 elected him to the United States Senate. There he remained until 1881, maintaining with great independence and vigor his belief in sound money and a protective tariff.

MacDONALD, William (1863–). An American historian, born at Providence, R. I. He graduated at the New England Conservatory of Music in 1884 and at Harvard in 1890. In the interval he was dean of the musical department of the University of Kansas. He became professor of history and economics at Worcester Polytechnic Institute (1892): was professor of history at Bowdoin until 1901, and from that year at Brown University. He published: *Select Documents Illustrative of the History of the United States* (1898); *Select Charters* (1899); *The Government of Maine* (1902); *Larger History of the United States* (1905), with T. W. Higginson; *Jacksonian Democracy* (1905); *Documentary Source Book of American History* (1908); *From Jefferson to Lincoln* (1913).

MACDONALD, Sir William Christopher (1831–1917). A Canadian manufacturer and capitalist. He was born at Glenaladale, Prince Edward Island, and was educated at the Central Academy, Charlottetown. He removed to Montreal in 1854, engaged in business, and later became an extensive manufacturer of tobacco. He acquired a large fortune, and was elected either president of, or a director in, several financial and industrial corporations. He made large gifts to educational and charitable institutions—$5,400,000 to McGill University, $5,000,000 to establish and endow the Macdonald Agricultural College and Normal School at Ste. Anne de Bellevue, P.Q., also endowments for manual-training and domestic-science schools in connection with the Ontario Agricultural College, and donations to several hospitals. He was appointed an associate member of the Protestant Committee of the Council of Public Instruction in 1903. He was knighted in 1898.

MACDON′ELL, Alexander (1769–1840). The first Roman Catholic Bishop of Upper Canada, born in the County of Inverness, Scotland. He was educated in Paris and at the Scots College, Valladolid, Spain; entered the priesthood (1787), and was for several years a missionary to his native land in the Lochaber country. Through his influence the first British Catholic regiment since the Reformation was enlisted, named the Glengarry Fencibles, and he was its chaplain in Great Britain, and afterward the organizer of a colony for its disbanded members (1803–04) in Glengarry Co., Ontario, where they were granted 160,000 acres of land. Father Macdonell assisted in raising the Canadian regiment of Glengarry Fencibles during the War of 1812–14, and he was consecrated Apostolic Vicar of Upper Canada (1820) and in 1826 was consecrated Bishop of Kingston. He was instrumental in the building of 48 churches throughout the province. In 1839 he returned to Britain to promote emigration from the Scotch Highlands, and died at Dumfries.

MACDONELL, Arthur Anthony (1854–). An English Orientalist. He was educated at Göttingen and at Corpus Christi College (Oxford), where he was Taylorian German scholar (1876), Davis Chinese scholar (1877), Boden Sanskrit scholar (1878), teacher of German (1880–99), deputy professor of Sanskrit (1888–99), and then Boden professor of Sanskrit. Macdonell has written: *A Sanskrit Grammar* (1886); *A New Sanskrit Grammar* (1901; 2d ed., 1911); *A Sanskrit-English Dictionary* (1892); *A History of Sanskrit Literature* (1900; 2d ed., 1913); "Vedic Mythology" (1897), in Bühler, *Grundriss der indo-arischen Philologie;* besides editing the *Bṛhaddevatā* (2 vols., 1904). Among his more recent works are a *Vedic Grammar* (Strassburg, 1910) and a *Vedic Index of Names and Subjects* (2 vols., London, 1912), in collaboration with A. B. Keith.

MACDONELL, Daniel James (1843–96). A Canadian clergyman. He was born at Bathurst, New Brunswick, and was educated at Queen's University, Kingston, afterward at Glasgow, Edinburgh, and Heidelberg universities. He was ordained a Presbyterian minister in Edinburgh in 1866, went to Ontario, was pastor of St. Andrew's Church, Peterborough (1866–70), and of St. Andrew's Church, Toronto, from 1870 until his death. Doubts as to the eternity of future punishment were inferred from one of his sermons in 1875, and for the next two years the Canadian Presbyterian church gave much consideration to the question of his doctrinal soundness. In 1877 he finally professed adherence to the orthodox Presbyterian view as contained in the Westminster Confession of Faith, though placing himself on record as unable to rid himself of doubts and difficulties. Although this attitude was accepted by the General Assembly as satisfactory, it was in effect a veiled compromise; but it was generally admitted that the controversy had quickened religious thought into greater doctrinal tolerance throughout the Protestant churches of Canada. Macdonell was a delegate to the Pan-Presbyterian Council in Philadelphia (1880) and assisted in preparing a Canadian Presbyterian hymnal (1878–81). He supported the Equal Rights party formed to resist alleged encroachments of the Canadian Catholic hierarchy in political affairs. Consult J. F. McCurdy, *Life and Work of D. J. Macdonell* (Toronto, 1897).

MACDONNELL, Antony Patrick, first Baron (1844–). A British administrator. Educated at Queen's College, Galway, he entered the Indian Civil Service in 1865, was made Chief Commissioner of the Central Provinces in 1891, was acting Lieutenant Governor of Bengal in 1893, member of the Viceroy's Council (1893–95), and Lieutenant Governor of the Northwest

Provinces (1895–1901). His excellent administrative record led to his appointment in 1902 as Undersecretary for Ireland. In 1904–05 he helped to set on foot the so-called "Devolution" scheme, which was attacked by the Ulster men as a Home Rule agitation in disguise. He retained office under the Liberal ministry of Campbell-Bannerman, played a prominent part in the movement inaugurated in 1906 for granting wide powers of local autonomy to Ireland, but retired in 1908 and was created Baron. He received the Oxford Litt.D. and D.C.L.

McDONOGH, măk-dŏn′ō, John (1779–1850). An American philanthropist, born in Baltimore. In 1880 he settled in New Orleans, where he soon became one of the wealthiest citizens. About 1822 he adopted a system of paying his slaves wages, thus enabling them to buy their freedom. Upon his death in 1850 the greater part of his fortune of more than $2,000,000 was left to be divided equally between the cities of Baltimore and New Orleans for purposes of public education. Baltimore devoted its share to establishing the McDonogh School; New Orleans has used its share for its public-school system.

MACDONOUGH, măk-dŏn′ō, Thomas (1783–1825). An American naval officer, prominent in the War of 1812 and frequently referred to as "The Hero of Lake Champlain." He was born at The Trappe (now Macdonough), Del., of Scotch-Irish parentage; entered the United States navy as a midshipman in 1800; served on the *Constellation* under Commodore Murray in 1801–02; and in 1803 started for Tripoli in the *Philadelphia*, Commodore Bainbridge, but at Gibraltar was placed in charge of a captured Moorish frigate, and thus escaped capture and imprisonment at the hands of the Tripolitans when the *Philadelphia* ran aground on Nov. 1, 1803. He was subsequently attached to the *Enterprise*, Commodore Decatur, and was one of the 70 men who, on Feb. 16, 1804, entered the harbor of Tripoli under Decatur and captured and destroyed the *Philadelphia*. For this service he was made a lieutenant in May, 1804, and soon afterward earned special mention for his gallantry in the bombardment of Tripoli. He served successively on the *Enterprise*, the *Syren*, the *Wasp*, the *John Adams*, and the *Essex*, and in 1810 was furloughed and commanded the *Gulliver*, a vessel in the merchant service. In the War of 1812 he served for a short time as first lieutenant on the *Constitution*, and commanded the Portland station for several months, and in September, 1812, he was placed in command of the United States naval force on Lake Champlain. In the following year he was promoted to be master commander, and in Plattsburg harbor, on Sunday, Sept. 11, 1814, with a fleet of 14 vessels carrying 86 guns and about 800 men, he completely defeated a British fleet of 16 vessels carrying 95 guns and about 1000 men under Capt. George Downie. For this victory he was commissioned captain, then the highest rank in the United States navy, and received a gold medal from Congress and an estate on Cumberland Head, near Plattsburg, from the Legislature of Vermont. He subsequently until his death commanded various vessels, and went on various cruises, the last of which was to the Mediterranean as commander of the *Constitution* in 1824. Consult K. C. Babcock, *Rise of American Nationality* (New York, 1906).

MACDOUGAL, măk-dōō′gal, Daniel Trembly (1865–). An American botanist. Born at Liberty, Ind., he was educated at De Pauw University (B.S., 1890), at Tübingen and Leipzig (1895–96), and at Purdue (Ph.D., 1897). He was agent of the United States Department of Agriculture in 1891–92; served as instructor (1893–95) and assistant professor (1895–99) of plant physiology at the University of Minnesota; directed the laboratories (1899–1904) and was assistant director (1904–05) of the New York Botanical Garden; and thereafter was director of the botanical research department of the Carnegie Institution. In 1910 he was president of the American Society of Naturalists. He published: *Experimental Plant Physiology* (1894); *Living Plants* (1898); *The Nature and Work of Plants* (1900); *Practical Text-Book of Plant Physiology* (1901); *Elementary Plant Physiology* (1902); *Influence of Light and Darkness upon Growth and Development* (1903); *Botanical Features of North American Deserts* (1908); *The Water-Balance of Succulent Plants* (1910); *The Condition of Parasitism in Plants* (1910); *Organic Response* (1911); *The Salton Sea* (1913).

MACDOUGAL, Sir Patrick Leonard (1819–94). A British soldier and military writer, born at Boulogne-sur-Mer, France. He studied at the Military Academy in Edinburgh and later at the Royal Military College at Sandhurst. In 1844 he went to Canada as captain in the Royal Canadian Rifle Regiment and remained there 10 years, rising to the rank of brevet lieutenant colonel. In 1855 he was sent to the Crimea. In 1865 he was appointed adjutant general of Canadian militia. He returned to England in 1869, but in 1878 was again sent to Canada as commander of the British forces, and during a time of tension between Great Britain and Russia offered to raise 10,000 disciplined Canadian volunteers, thus establishing a precedent of colonial military aid in the quarrels of the Empire. He returned to England in 1883 and two years afterward retired from active service with the rank of general. His writings include: *Emigration: Its Advantages to Great Britain and her Colonies* (1848); *The Theory of War* (2d ed., 1858); *The Defense of the Canadian Lakes and its Influence on the General Defense of Canada* (1862); *Modern Warfare as Influenced by Modern Artillery* (1864).

McDOUGALL, Alexander (1731–86). An American patriot and soldier. He was born on the island of Islay, Scotland, but emigrated with his father to New York in 1755. He served in the French and Indian War, and later became a prosperous merchant. He was an ardent opponent of the crown, and for writing an address called *A Son of Liberty to the Betrayed Inhabitants of the Colony* he was imprisoned for several months. In 1774 he presided over the meeting that prepared the way for the election of delegates for New York to the First Continental Congress. He became colonel of the First New York Regiment in 1775, brigadier general in the Continental army in 1776, and major general in 1777, and fought at Long Island, White Plains, Germantown, and elsewhere. In 1781–82 and again in 1784–85 he was a member of the Continental Congress, and was elected Minister of Marine, thereby becoming the first Secretary of the Navy. He was New York State Senator from 1783 to 1786.

McDOUGALL, George Millward (1820–76). A Canadian pioneer missionary. He was born in Kingston, Ontario, and in early youth went with his parents to the northern part of the province, on Georgian Bay. The condition of the Indians in that region influenced him to become a missionary. He studied at Victoria College and later was superintendent of the industrial school at Alderville. Admitted to the Wesleyan Methodist ministry in 1850, he was assigned to missionary work among the Indians of northern Ontario. He established stations and labored at Garden River (1851–57), Rama (1857–60), and afterward (at Rossville Station, Norway House, 1860–63) was in charge of a vast region then under control of the Hudson's Bay Company. He went west to Victoria, on the Saskatchewan River (1863–71), and to Edmonton (1871–74), laboring afterward in the Bow River valley. McDougall's thorough knowledge of woodcraft enabled him to explore successfully large tracts of territory, and his understanding of the character of the Indians gained for him their complete confidence. He appreciated the dangerous conditions which resulted in the rebellion of 1869 under Louis Riel (q.v.), but his warnings were unheeded; later, at the request of the Manitoba government, he rendered important service in quieting the Indians. He had farsighted views of settlement and political organization, and his advice was much sought. In 1875 he visited eastern Canada and Great Britain. He perished in a snowstorm in January, 1876. His mission work was the foundation of Methodism in large regions of the Canadian Northwest. Consult John McDougall, *Pioneer, Patriot, and Missionary* (Toronto, 1888).

McDOUGALL, JOHN (1842–). A Canadian missionary and author. He was born at Owen Sound, Ontario, and was educated at mission schools and at Victoria University. His early life was spent among the Indians of Georgian Bay and Lake Superior, and in 1860 he went to the Northwest Territories and taught school at Norway House, a trading station. He afterward filled several pastoral and administrative positions in his denomination, but his chief work was as a missionary among the Indians, of whose languages and character he had a knowledge which made him of valuable assistance to the government of Canada. He was commissioned to aid in establishing peaceful relations with the Indians after the rebellions of 1869–70 and 1885; and also advised in making treaties with the Indians. He published: *A Cree Hymn Book* (1888); *Pioneer, Patriot, and Missionary* (1888), a life of his father, George McDougall; *Forest, Lake, and Prairie* (1895); *Saddle, Sled, and Snowshoe* (1896); *Pathfinding on Plain and Prairie* (1898); *In the Days of the Red River Rebellion* (1900); *On Western Trails in the Early Seventies* (1902).

McDOUGALL, WILLIAM (1822–1905). A Canadian statesman, born in Toronto. He studied at Victoria College, Cobourg, and was admitted as a solicitor (1847) and as a barrister (1862). In 1848 he founded the *Canada Farmer* and in 1850 the *North American*, in which he advocated advanced Liberal principles with remarkable ability. After the *American* was absorbed by the Toronto *Daily Globe* in 1857, he continued to write for the latter until 1870. He was a Liberal member of the Canada Legislative Assembly in 1858–67 and of the Ontario Legislature in 1875–78. From 1862 to 1864 he was a member of the Executive Council and Commissioner of Crownlands, and from 1864 to 1867 Provincial Secretary. After Confederation in 1867 he became Minister of Public Works in the first Dominion cabinet, and in 1869 was Lieutenant Governor of Rupert's Land and the Northwest Territories. In 1865 and 1866 he was chairman of a commission for opening trade relations with Mexico, Brazil, and the West Indies, in 1868 was commissioner to London, England, for the acquisition of the Northwest Territories, and in 1873 went to London as special fisheries commissioner. He published: *Eight Letters on the Red River Rebellion* (1870); *Six Letters on the Amendment of the Provincial Constitution* (1872); *An Open Letter on the Federalism of the Federal Constitution of 1867* (1887).

McDOUGALL, WILLIAM (1871–). An English psychologist. He was educated at Owens College, Manchester, at Cambridge, and at St. Thomas's Hospital, London; became fellow of St. John's, Cambridge, in 1898, a reader in University College, London, in 1902, and then a reader at Oxford and fellow of Corpus Christi College. He was elected a fellow of the Royal Society in 1912. McDougall did important work in abnormal and aboriginal psychology, and he wrote: *Primer of Physiological Psychology* (1905); *Introduction to Social Psychology* (1908); *Body and Mind: A Defense of Animism* (1911); *Pagan Tribes of Borneo* (1912), with Hose; *Psychology, the Study of Behaviour* (1912).

MacDOWELL, mak-dou'ĕl, EDWARD ALEXANDER (1861–1908). The greatest and most original of American composers. He was born of Scotch-Irish parentage in New York City, Dec. 18, 1861. His first instruction he received from Buitrago, Desvernine, and Teresa Carreño. Carreño was not only the first but also one of the most enthusiastic interpreters of the works of her distinguished pupil. In 1876 MacDowell entered the Paris Conservatory, where he studied the piano under Marmontel and composition under Savard, but, becoming dissatisfied, he went to Germany, first to Wiesbaden (1878), where he studied a few months with Louis Ehlert, and then to Frankfort, entering the conservatory in 1879. Here he continued the piano with Karl Heymann and composition with Raff, both of whom were quick to recognize their pupil's unusual talent. When Heymann resigned in 1881 he recommended MacDowell as his successor. The suggestion, however, was disregarded by the authorities, and MacDowell went as principal teacher of piano to the conservatory at Darmstadt. In 1882 Raff introduced him to Liszt, who was so favorably impressed by the young man's First Modern Suite for piano, op. 10, that he brought about its performance the same year at the annual concert of the Allgemeiner Deutscher Musikverein. The recognition that he gained, both as composer and as pianist, induced MacDowell to decide to settle in Germany. In 1884 he returned for a short visit to his native land, where he married a former pupil, Miss Marion Nevins. During the next four years he lived at Wiesbaden, devoting his time to teaching and composition. In 1888 he returned permanently to the United States, taking up his residence in Boston. There he rapidly rose to prominence through his own masterly rendition of his piano works, as well as through the active propaganda for his orchestral compositions on the part of the Boston Symphony Orchestra under Arthur Nikisch and Emil Paur. He was one of the seven original members of the American Academy of Arts and Letters. When, in 1896, the department of music was founded at Columbia University the committee unanimously tendered the professorship to MacDowell as "the greatest musical genius America has produced." The demands upon his time in this new position were such as to oblige him to give up his pianistic career. Yet these years were the most fruitful in regard to his creative work. In 1904 he resigned. Alarming signs regarding his mental condition began to appear, and in the fall of the following year he became insane. He died in New York on Jan. 23, 1908.

Of all American composers MacDowell is the one whose music exhibits the most striking originality and individuality of style. Yet he is not sufficiently great to create a distinctively American school, in the sense that we speak of a German, Russian, or French school. MacDowell is essentially a German romanticist in the best sense of the word. As a mood painter he is not easily excelled, and he generally finds his inspiration in the contemplation of nature or in some striking lines of poetry. His originality manifests itself rather in the invention of short, expressive themes than in thematic development. As a master of the smaller forms he may well be ranked with Schumann and Grieg. His works include the symphonic poems *Hamlet and Ophelia*, *Lancelot and Elaine*, *Lamia*, *The Saracens*, *Lovely Alda;* two suites for orchestra; two concertos for piano and orchestra, in A minor and D minor; four sonatas for piano, *Tragica*, *Eroica*, *Norse*, *Keltic;* many smaller compositions for piano, among which are the magnificent *Woodland Sketches* and *Sea Pieces;* numerous songs and part songs. Consult Lawrence Gilman, *Edward MacDowell* (New York, 1909), and E. F. Page, *Edward MacDowell: His Work and Ideals* (ib., 1910).

McDOWELL, Ephraim (1771–1830). An American surgeon, born in Rockbridge Co., Va. He attended medical lectures in Edinburgh in 1793–94; settled at Danville, Ky., in 1795, and attained prominence as a surgeon. In 1809 he performed the first operation recorded in the United States in ovarian surgery. A report of this and of other cases appeared in the *Eclectic Repertory and Analytic Review* in 1817. He was skillful in many branches of the surgical art.

McDOWELL, Irvin (1818–85). An American soldier, prominent as a Federal officer in the Civil War. He was born in Columbus, Ohio; studied at the College of Troyes in France, and in 1838 graduated at West Point, where from 1841 to 1845 he was stationed as adjutant. He served in the Mexican War first as aid-de-camp and then as assistant adjutant general, under General Wool, and in February, 1847, was brevetted captain for gallantry in the battle of Buena Vista. He was promoted major in 1856. Early in 1861, after the outbreak of the Civil War, he was at Washington engaged in organizing the volunteer troops. On May 14 he was promoted to be brigadier general of volunteers. On the 27th he was placed in command of the Army of the Potomac and, urged forward by President Lincoln and the War Department under the impulsion of public opinion in the North, he advanced into Virginia in the middle of July. On the 21st he met Generals Beauregard and Johnston, commanding the Confederate army, at Bull Run, and, in spite of his skillfully laid plan of battle, his raw recruits gave way and he was badly defeated. (See Bull Run, First Battle of.) Soon afterward he was replaced by General McClellan, under whom he commanded the First Corps of the Army of the Potomac, which, however, was on April 4, 1862, formed into the Army of the Rappahannock and assigned to the defense of Washington. On March 14 of this year he was made major general of volunteers. From Aug. 12 to Sept. 6, 1862, he commanded the Third Corps of the Army of Virginia, and was engaged successively in the battles of Cedar Mountain (August 9) and Rappahannock Station (August 25) and in the second battle of Bull Run (August 29–30), taking an especially prominent part in the last. On September 6 he was relieved from duty in the field, and, regarding this as a reflection upon his professional abilities and past services, he asked for a court of inquiry, which, after carefully considering all charges, reported that "the interests of the public service do not require any further investigation into the conduct of Major General McDowell." He served from May to July, 1863, as president of the board appointed to investigate alleged cotton frauds, and from July, 1863, to May, 1864, was president of the board for retiring disabled officers. On March 13, 1865, he was brevetted major general in the regular army for bravery at the battle of Cedar Mountain, and seven years later he was promoted to the rank of major general in the regular army to succeed General Meade. After the war he was in command of various military departments until 1882, when he retired from active service.

McDOWELL, James (1796–1851). An American statesman. He was born in Rockbridge Co., Va.; graduated at Princeton in 1817; became a member of the Virginia Legislature in 1831; was Governor from 1842 to 1844; and was a Representative in Congress from 1847 to 1851. McDowell was a States' rights man, but was an opponent of slavery and advocated its gradual abolition. He was an orator of much power and took an especially active part in the debates leading up to the Compromise of 1850.

McDOWELL, William Fraser (1858–). An American Methodist Episcopal bishop, born at Millersburgh, Ohio. He graduated from Ohio Wesleyan University in 1879 and from the Boston School of Theology in 1882, and received the degree of Ph.D. from Boston University in 1893. He entered the ministry in 1882. From 1890 to 1899 he was chancellor of the University of Denver, and thereafter, until he was elected Bishop in 1904, was corresponding secretary of the board of education of his denomination. He was a member of the Colorado State Board of Charities from 1894 to 1899, a member of the International Committee of the Young Men's Christian Association after 1896, president of the Religious Education Association in 1905–06, and president of the board of trustees of Northwestern University after 1906. He is the author of *In the School of Christ* (1910), *A Man's Religion* (1913), and of many articles in religious periodicals.

MACDUFF′. A thane of Scotland who was instrumental in the defeat of Macbeth at the battle of Lumphanan in 1057. He is a character in Shakespeare's *Macbeth*, where he is represented as a chief opponent of Macbeth.

MACDUFF, John Ross (1818–95). A clergyman of the Church of Scotland. He was born at Bonhard, Perthshire; studied at Edinburgh; entered the ministry (1843); was settled in Glasgow (1855–70), and afterward in England. Many of his devotional writings were very popular and had a large circulation. He wrote *Morning and Night Watches* (1852); *The Wooden Tree of Lebanon* (1854); *Footsteps of Saint Paul* (1855); *Brighter than the Sun* (1877); *Wells of Baca* (1879); *Matin and Vesper Bells* (2 vols., 1890), poems. Consult his *Reminiscences,* edited by his daughter (1896).

McDUF'FIE, George (1790–1851). An American orator and political leader. He was born in Columbia Co., Ga.; graduated at South Carolina College in 1813; and was admitted to the bar in 1814. He became a member of the South Carolina Legislature in 1818; was a Representative in Congress from 1821 to 1834; was Governor of South Carolina from 1834 to 1836; and was United States Senator from 1843, but was forced to resign in 1846 on account of ill health. He was perhaps the boldest member of the famous South Carolina Nullification Convention of 1832, and drafted the address of South Carolina to the people of the United States. He supported Jackson in the election of 1828, but soon became one of his leading opponents, and, as chairman of the Committee on Ways and Means, was one of the strongest champions of the United States Bank against presidential attacks.

MACE. Originally a weapon in the shape of a club, but now one of the insignia of office and a symbol of authority used in legislative chambers.

MACE (OF., Fr. *macis*, Sp. *mácis*, It. *mace*, from Lat. *macir*, from Gk. *μάκερ*, *maker*, an East Indian spice). A spice which consists of the dried aril which surrounds the seed of the nutmeg (*Myristica fragrans*). When fresh it is blood-red, lacerated, and somewhat fleshy; after drying in the sun for a few days, and being flattened for market, it is bright orange yellow and has a peculiar waxlike texture. It contains a clear, yellow, volatile oil obtained by distillation, and a red, buttery, fixed oil. It is exported chiefly from Penang and Singapore, where it is received from the Spice Islands, also from the West Indies, where it is cultivated.

MACÉ, må'så', Jean (1815–94). A French publicist and educator, born in Paris. At the time of the revolution of 1848 he supported the new government with enthusiasm, as one of the editors of *La République.* On Napoleon's coup d'état, in 1851, he was obliged to leave Paris and became teacher of natural sciences and literature in a seminary for girls in Alsace. Here he conceived the plan of popularizing scientific studies for children and began by the publication of the *Histoire d'une bouchée de pain* (History of a Mouthful of Bread, 1861). In 1866 he had organized a teachers' league, *Ligue de l'Enseignement,* which promoted popular education, not only through schools, but also through the formation of communal libraries and by its insistence upon free and obligatory education. In 1883 he was elected to the Chamber as life senator. A monument to him was erected in Paris in 1900.

MACEDO, må-sā'd*o͞o*, Joaquim Manoel de (1820–82). A Brazilian epic, lyric, and dramatic poet, novelist, and scientist, born at São João de Itaborahy (Rio de Janeiro). He became a doctor of medicine, but was soon elected professor of Brazilian history and geography in the College of Dom Pedro at Rio de Janeiro. In 1854 he was elected deputy. He was an active member of the Historical and Geographical Institute. His productions include several novels, among them *Moreninha* (1844; 5th ed., 1877) and *O moço louro* (1845; 5th ed., 1877); the tragic plays, *O Cégo* (1849) and *Cobé* (1852); the erotic epic lyric *A Nebulosa* (1857), considered by many Brazilians his greatest work; and *Nociones de cronografía del Brasil* (1873), translated into French by Halbout.

MACEDO, José Agostinho de, Padre (1761–1831). A Portuguese poet and prose writer, born at Beja. After studying Latin and rhetoric with the Oratorians, he entered the Augustinian Order in 1778. His undisciplined nature caused him to be sent from one monastery to another and, after several years, to be expelled from his order. Shortly thereafter (1792) his licentious life at the capital resulted in his being unfrocked. Powerful friends secured for him a papal bull secularizing him and allowing him to keep his ecclesiastical status. In journalism and preaching he soon gained a unique reputation—in 1802, recognized as one of the leading preachers of the day, he was appointed one of the court chaplains. He tried his hand at politics and was elected to the Chamber of Deputies (1812). In 1830 he was made court chronicler by the usurper Dom Miguel. He founded and edited several journals, the tone of all being ultraviolent; and being himself an extreme absolutist, he recommended, despite his priestly office, the general massacre of all Miguel's opponents. From 1824 to 1829 he was censor of books. Despite his wild life he left, at his death, a host of friends. He was the first writer in Portugal to pay careful attention to didactic and descriptive poetry, and his poem *A Meditação* (1813) is a remarkable example thereof. He tried to outdo Camões by a colorless work called *O Oriente,* treating the same subject as *Os Lusiadas.* This effort to pose as Portugal's greatest poet led Boccage to flay him in his *Pena de Talião.* Macedo's satirical poem in six cantos, *Os Burros* (1812–14), wherein men and women of all grades of society and whether living or dead, were named and handled in a most shameless manner, shows his character at its worst. As a critic, his best writings are *Motim literario* (1811), *As Pateadas* (1812), and his periodical *O Desaprovador* (1818–19). Consult: Theofilo Braga's edition of *Memorias para la vida intima de José Agostinho de Macedo* (Lisbon, 1899); *Cartas e opusculos* (ib., 1900); *Censuras a diversas obras* (1901).

MACEDONIA, măs'ē-dō'nĭ-å, or **MACEDON** (Lat., from Gk. Μακεδονία, *Makedonia*). Anciently the name of the district north of Thessaly on the northwestern shore of the Ægean (Map: Greece, C, D, E 3). Originally its territory was confined to the region of Mount Olympus and the Cambunian Mountains, east of the ridge which forms the boundary of Epirus and Illyria, and west of the Axius, a river emptying into the Thermaic Gulf. Later under Philip II it was extended as far east as the Strymon. The country was on the whole mountainous, but where it touched the sea, on the shores of the Thermaic Gulf, was a fertile plain, watered by the Haliacmon and the Axius. The valley of the Strymon also was productive. Macedonia was famous among the ancients for its gold and silver mines and its productiveness in oil and wine.

It contained a number of flourishing cities, particularly Pella, the capital; Pydna, Thesselonica (Therma), Potidæa (later rebuilt as Cassandria), Olynthus, Philippi, and Amphipolis. (See the separate articles on these cities.) These cities, with the exception of Pella and Philippi, were colonized by Greeks—Ionian Greeks, except in the case of Potidæa, which represented Dorian colonization. The Macedonians seem to have been a Grecian tribe which had remained behind during the earlier migrations and so had been cut off from the later development of the Hellenes (q.v.). Their language was almost certainly a Greek dialect, and their government bears a striking resemblance to the Homeric state. At the same time they were not recognized by the Greeks as entitled to the Hellenic name, though their kings claimed descent from Hercules and were allowed, as Greeks, to compete in Olympic Games. The scattered tribes that inhabited the region are said to have been first brought under a common rule about 700 B.C., when the supremacy was acquired by the family of the Argeadæ. Their first capital was at Ægæ (see first EDESSA), but later they established themselves at Pella. The history of Macedonia is involved in much obscurity till about 490 B.C., when the Persians subdued the country, so that the Macedonian King, Alexander I, was compelled to take part with Xerxes in his invasion of Greece. On the retreat of the Persians after the battle of Platæa in 479 B.C., Macedonia again recovered its independence. The development of the country was hampered by the chain of Greek colonies along the coast, and especially by the powerful cities of Chalcidice (q.v.), with Olynthus at their head. Under the vigorous reign of Archelaus (q.v.), who died 399 B.C., Macedonia greatly increased in prosperity, power, and culture, after the Greek model; but after his death a period of civil wars and contests for the throne ensued, which ended in the accession of Philip II (q.v.), 359 B.C., who not only seated himself firmly on the throne, but knew how to develop the resources of his kingdom and so to direct the warlike spirit of his subjects as greatly to extend his dominions. Before his death he was recognized as the leader of Greece. He had also brought the Illyrians and the Thracians under subjection and completely destroyed the independence of the Greek cities on the coast. His son, Alexander the Great (q.v.), brought half the then known world under his sway, but after his death the Macedonian Empire was divided among his generals. (See GREECE, *Ancient History*, last two paragraphs.) Macedonia itself fell to the lot of Antipater (q.v.), after whose death (319 B.C.) ensued another period of civil wars which ended in the accession of Antigonus Gonatas (q.v.). His successors were involved in constant wars with the Ætolian and the Achæan leagues, and finally with the Romans, who broke the power of Philip V at Cynoscephalæ (q.v.; see also FLAMININUS, 2) in 197 B.C., after which they proclaimed the independence of Greece and later, under the command of Lucius Æmilius Paulus (q.v.) Macedonicus, overthrew Perseus (q.v.), his successor, at Pydna (168 B.C.). A renewed attempt at a rising in 148 B.C. was followed in 146 B.C. by the organization of the country as a Roman province, in which Thessaly and part of Illyria were included. In the New Testament the term Macedonia always means the Roman province. It was one of the most important fields of the missionary labors of Paul, who founded churches in its cities on his second journey (Acts xxii. 15) and visited the province several times. The epistles to the Thessalonians and the Philippians were addressed to Macedonian churches, and the loyalty and devotion of Macedonian Christians are often commended in Paul's letters. After the final division of the Roman Empire (395 A.D.) Macedonia formed part of the Eastern or Byzantine Empire. It was overrun by barbarous hordes, and by the seventh century the old semi-Greek Macedonians were extinct. For a considerable period the Bulgarians held sway in Macedonia. Early in the eleventh century the Byzantine rule was reëstablished. In the fourteenth century the country was included in the great Servian realm, and after another period of Byzantine rule it came, in the fifteenth century, under the dominion of the Turks.

There is now no official division known as Macedonia, but the name came into wide use in the nineteenth century in connection with the strife of nationalities in the Turkish dominions, the ancient region corresponding nearly to the Turkish Vilayet of Saloniki, together with the eastern part of that of Monastir. The population consists mainly of Slavs (made up of Bulgarian and Serb elements, the Bulgarian element predominating in the language), Turks, Greeks, Albanians, and Kutzo-Vlachs (Macedonian Rumans). The agitation of the Christian subjects of the Porte in this portion of the Turkish Empire, and the ambition of Greece, Servia, and Bulgaria to annex part of the territory, combined to create the so-called Macedonian question in eastern European politics. At the Congress of Berlin, 1878, certain stipulations were made for autonomous institutions for the Macedonian Christians. The Turkish government, however, pursued its usual policy of delay, and this led to a strong revolutionary movement. About 1900 there was organized at Sofia, under the auspices of Boris Sarafoff, a Macedonian committee having for its object the wresting of Macedonia from Turkish rule. The influence of the committee speedily made itself felt in active guerrilla warfare. In 1902 the condition of the Macedonian vilayets was such as to call for the intervention of the Powers. A programme of reform was proposed by Austria-Hungary and Russia and was accepted by the Sultan, but it remained a dead letter, the Turkish government profiting by the jealousies among the Powers and more still by the internecine strife raging among the Christian population of Macedonia. The activity of the Bulgarian bands unofficially backed by their government was regarded with displeasure by the Greek government as threatening the interests of the Hellenic population of the vilayets. A further cause of dissension lay in the fact that the Bulgarians of Turkey recognized the religious authority of the Bulgarian exarch in denial of the claims of the Greek patriarch. Thus, Greek and Servian bands were arrayed against the Bulgarian Comitajis and all against the Turkish troops. In August, 1903, a general Bulgarian uprising broke out in Monastir and was met by the Turks with fierce repression. Before the end of the year it was reported that 15,000 Bulgarians had perished. In October, 1903, a scheme of reforms was submitted to the Sultan, who under pressure from all the Powers accepted it in the following month. It provided for the appointment of Austrian and Russian special agents to assist the Turkish inspector general in dealing with the needs of the Christian population, the reorganization of the gendarmerie in the three vilayets under a foreign general with a number of foreign officers under him, and the repatriation of the fugitive inhabitants with the aid of the Turkish government. Strife between Greek and Bulgarian bands was rife in 1904 and 1905. In the latter year the Powers presented a series of demands looking towards the improvement of the finances in the vilayets and insisted on the appointment of a board of six international commissioners to superintend the execution of the reforms. The Sultan yielded in face of an international naval demonstration before Mytilene in December. Unfortunately the general scheme of Macedonian reforms was far from complete, and there was slight harmony among the Great Powers. Austria-Hungary and Germany wished to meddle as little as possible with the administration of Turkish provinces, while Russia, backed by Great Britain and France, desired to go much further. The Turkish revolution of 1908 (see TURKEY) was directed not only against the Sultan's tyranny but against his feeble policy, which permitted foreign Powers to interfere in the domestic affairs of the Empire. Following the success of the Young Turks, the special privileges long accorded to the subject races in Macedonia were curtailed, public meetings were prohibited, constitutional and national clubs were suppressed. This policy of Ottomanizing Macedonia had the effect of driving the people into more or less open rebellion against the Turks and of drawing the Christian nationalities together. From this situation sprang the Balkan Alliance of 1912 between Bulgaria, Greece, Servia, and Montenegro, and the Balkan War (q.v.) of 1912–13. The partition of Macedonia among Greece, Bulgaria, and Servia, as determined by the Treaty of Bucharest (1913), is described in the article on the BALKAN WAR. Conflicting interests of the Great Powers in Macedonia constituted an important element in the general causes of the great War in Europe (q.v.).

Bibliography. Abel, *Makedonien vor König Philip* (Leipzig, 1847); Heuzey and Daumet, *Mission archéologique de Macédoine* (Paris, 1876); Cousenéry, *Voyage dans la Macédoine* (ib., 1831); Leake, *Travels in Northern Greece* (London, 1835); Döll, *Studien zur Geographie des alten Makedoniens* (Stadtamhof, 1891); Nikolaides, *La Macédoine* (Berlin, 1899); Gopčevič, *Makedonien und Alt-Serbien* (Vienna, 1889); Niese, *Geschichte der griechischen und makedonischen Staaten seit der Schlacht bei Chaeronea* (3 vols., 1893–1903); Hoffmann, *Die Makedonen* (1906); Struck, *Makedonische Fahrten* (1908); Gercke Norden, *Einleitung in die Altertumswissenschaft*, iii, 118 ff. (2d ed., Leipzig, 1913).

MACEDONIAN (măs′ê-dō′nĭ-ăn) **LANGUAGE.** The native language of the ancient Macedonians. It is only imperfectly known through glosses preserved by Suidas and other lexicographers and through proper names. More than 100 Macedonian words with their Greek equivalents were collected by Sturz. About the same number of proper names may be found explained in Fick's dissertation. As to the character of the language, K. O. Müller, G. Meyer, F. Blass, and Kazarow have refused to recognize it as a Greek dialect, urging a closer kinship to the Illyrian or the Thracian; while Sturz, Abel, Basmatzides, Fick, Demitsa, Ed. Meyer, Hatzidakis, Kretschmer, Beloch, and apparently Brugmann and Koersh have maintained that Macedonian is only a Greek dialect. The strongest argument against the latter view is that *β*, *γ*, and *δ* have a tendency to take the place of Greek *φ*, *χ*, and *θ*, as in Slavonic, Celtic, Lithuanian, and Illyrian. It is possible, however, that *β* and *δ* were pronounced by the Macedonians as *bh*, *v*, and *dh* (*th* in *this*), and that the change of *ph* to *bh* and *th* to *dh* has nothing in common with the process by which the Illyrian *b* and *d* have been derived from *bh* and *dh*. Of the Macedonian *χ* there are many instances. The fact that the digamma has disappeared without compensation only seems to show the operation of the same laws as govern Greek speech. While many Macedonian words and nouns are not yet satisfactorily explained, a great number have been. Alexander, his generals, and his nobles spoke Attic Greek as well as their native dialect. But Attic Greek cannot have been long in vogue in Macedonia. When, therefore, the nobles are called ἑταῖροι, as in the Homeric poems, and many proper names occur that are found in Homer but not in the later times, the only probable conclusion seems to be that the Macedonians were a Greek people remaining behind when the rest moved into the peninsula, and that their language was a dialect retaining some peculiarities lost in the other dialects and developing by contact with neighboring Illyrian and Thracian languages some peculiarities of its own.

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MACEDONIANS. A party which arose towards the close of the Arian controversy and took its name from Macedonius, who became Patriarch of Constantinople in 341 and was finally deposed in 360, in which year he died. Their distinctive doctrine was the denial of the divinity of the Holy Ghost. After Macedonius the leader was Marathonius, Bishop of Nicomedia, from whom the party is sometimes called Marathonians. It was a considerable one, but its doctrine was condemned in the second General Council (Constantinople, 381), when there was also added to the Nicene creed the special clause by which the divinity of the Holy Ghost is defined. They are also called *Pneumatomachi*, or Adversaries of the Spirit. Consult Adolf Harnack, *History of Dogma*, vol. iv, translated from the German (Boston, 1899).

MACEIÓ, mä′så-yō′, or **MAÇAYÓ**, mä′sī-yō′. The capital of the State of Alagôas, Brazil, situated on the Atlantic coast, 130 miles southwest of Pernambuco (Map: Brazil, K 5). The town is pleasantly located, has a fine cathedral, a government building, and a lyceum. It manufactures cotton goods and machinery and carries on an active commerce. Its harbor is provided with shipyards. It exports cotton, corn, and hides, and is the seat of a United States consular agent. Pop. (est.), 40,000.

McEN'TEE, Jervis (1828–91). An American landscape painter. He was born at Rondout, N. Y., first engaged in trade, and later studied art for a short time with F. E. Church. In 1854 he opened a studio in New York, where he soon obtained a high position among American painters of the Hudson River school (q.v.), most of whom he far surpassed in feeling and inspiration and personality, though he sometimes showed lack of thorough training. His principal success was gained in the depiction of grave mountain or woodland scenery. In 1861 he was elected a member of the American Academy of Design. His works include: "Indian Summer" (1861); "October Snow" (1870); "Winter in the Mountains" (1878); "Shadows of Autumn" (1886); "A Cliff in the Catskills" (1888); "Autumn Landscape" (Metropolitan Museum, New York).

MACEO, mȧ-sā'ō, José Antonio (1848–96). A Cuban patriot and military leader. He was born at Santiago de Cuba, and in the Cuban revolution of 1868–78 joined the insurgents as a private. Though originally but a mulatto farm hand, he rose to be second to Gómez among the Cuban leaders. He defeated Martínez Campos at Demajayabo and La Galleta, conducted a very skillful campaign at Baracoa, and in 1878 completely routed Santocildes at San Ulpiano. He refused to sign the Peace of Zanjón. Having traveled in various American countries, he unsuccessfully attempted in 1879, in 1885, and in 1890 to start a fresh Cuban revolution. In the uprising of 1895 he took a most distinguished part. Probably the most brilliant achievements of the Cubans during the war were his two invasions of, and his campaign in, Pinar del Río Province, in which he was opposed to the best of the Spanish troops; and his combats at Paralejo, Jobito, Mal Tiempo, Sao del Indio, and Candelaria. Accompanied by only his staff, he crossed the trocha between Majana and Mariel, was surrounded by a considerable Spanish force, and was killed, Dec. 7, 1896.—His brother José Rafael Maceo was almost equally important to the cause of Cuban independence, serving as interim chief of the Army of the East, making several brilliant campaigns, and acting as Chief of Jurisdiction for the island. He died early in July, 1896, as the result of wounds received in the battle of Loma del Gato. Some idea of the importance of the two brothers may be gained from a work written by General Weyler, *Mi mando en Cuba, 10 Febrero, 1896, á 31 Octubre, 1897* (5 vols., Madrid, 1910–11).

MACERATA, mä'chȧ-rä'tȧ. A walled town of Central Italy, capital of the Province of Macerata, and a bishop's see. It is finely situated in the midst of hills, on a lofty eminence, about 22 miles south of Ancona, and commands a view of the Adriatic Sea and the Apennines (Map: Italy, D 3). The streets are straight and well paved, and there are some fine public edifices, including a modern cathedral, conventual establishments, and palaces. The *palazzo municipale,* or town hall, is a beautiful building of the thirteenth century. Macerata is prosperous, and a provincial centre of intellectual and social Italian life. The chief industries are the manufacture of bricks, matches, terra cotta, and chemicals. Of its ancient university (335 students in 1913), however, only the faculty of jurisprudence is still in existence. Pop. (commune), 1901, 22,784; 1911, 22,940.

McEWEN, mak-ū'en, Walter (1860–). An American landscape, portrait, and figure painter. He was born in Chicago and studied under Cormon and Robert-Fleury in Paris, where he thereafter resided. He spent much time in Holland—his Dutch landscapes of glowing sunlit poppy fields or monotonous dunes, well drawn and painted with much brilliancy, are perhaps his best work. He also painted portraits, interiors with delicate light effects, and occasionally decorative panels. Among such panels were two for the Liberal Arts Building at the Chicago Exposition, which showed skill of arrangement and distinction of line, and "Greek Heroes" in the Hall of the Congressional Library, Washington, executed in a somewhat coldly classic style. Among his paintings in public galleries are "Sunday in Holland" (Luxembourg); "An Ancestor" (Corcoran Gallery, Washington); "The Letter" (Art Association, Indianapolis); "Phyllis" (Pennsylvania Academy); "Lady in White Satin" and "Judgment of Paris" (Art Institute, Chicago). McEwen is represented also in the museums of Ghent, Liége, Magdeburg, and Budapest. He was made an Officer of the Legion of Honor and of the Belgian Order of Leopold and received many awards, including gold medals at Berlin (1891), Munich (1897 and 1901), Vienna (1902), St. Louis (1904), and Liége, the medal of honor at Antwerp in 1894, the Lippincott prize at Philadelphia in 1902, and the Harris prize at Chicago (1904).

MACFADYEN, mak-făd'yen, Allan (1861–1907). A British bacteriologist, born in Glasgow. He graduated at the University of Edinburgh in 1886 and studied also at Bern, Göttingen, and Munich. In 1891 he became director of the Jenner Institute of Preventive Medicine, London, and in that connection he did much to promote bacteriological research. He originated a process of obtaining the cell plasma of parthogenic organisms by freezing the latter with liquid air and then grinding them. He was Fullerian professor of physiology at the Royal Institution in 1901–04.

McFADYEN, John Edgar (1870–). A Scottish biblical scholar. He was born in Glasgow, studied there at the university and Free Church College and at Oxford and Marburg. He was professor of Old Testament literature and exegesis in Knox College, Toronto, from 1898 to 1910, when he was called to a similar chair in the United Free Church College in Glasgow. Among his published works are: *Messages of the Prophetic and Priestly Historians* (1901); *Old Testament Criticism and the Christian Church* (1903); *Messages of the Psalmists* (1904); *Introduction to the Old Testament* (1905); *The Prayers of the Bible* (1906); *Ten Studies in the Psalms* (1907); *Commentary on Corinthians and Galatians* (1909); *The Historical Narrative of the Old Testament* (1912); *A Cry for Justice* (1912), being a study of the Book of Amos.

McFARLAND, mak-fär'land, J(ohn) Horace (1859–). An American printer and leader in civic improvement, born at McAlisterville, Juniata Co., Pa. He was educated at Harrisburg, Pa., and, becoming a printer, established in 1889 the Mount Pleasant Press, which two years later was renamed the J. Horace McFarland Company. He edited a department of the *Ladies' Home Journal* in 1904–07 and was treasurer of the Suburban Press, publishing *Suburban Life* in 1908–11. He lectured on municipal and conservation topics and was president of the American League for Civic Improvement in 1902–04 and of the American Civic Association after 1904. Besides contributions to various magazines, he is author of *Getting Acquainted with the Trees* (1904) and *Photographing Flowers and Trees* (1911).

McFARLAND, JOHN THOMAS (1851–1913). An American Methodist clergyman, educator, and editor, born at Mount Vernon, Ind. He was educated at Iowa Wesleyan University, at Simpson College (A.B., 1873), and at Boston University School of Theology (B.D., 1878). He entered the ministry of the Methodist Episcopal church in 1873. From 1882 to 1884 he was vice president, and from 1884 to 1891 president, of Iowa Wesleyan University. He afterward held several important pastorates until 1904, when he became editor of all the Sunday-school publications of his church and secretary of the Sunday School Union. In 1908 the secretaryship became a separate office. He was the author of *Preservation vs. the Rescue of the Child* (1906), *The Book and the Child* (1907), and *Etchings of the Master* (1909); had in preparation and nearly ready for publication a Sunday School Cyclopædia; and had planned a teacher's commentary on the New Testament.

MACFARLANE, măk-fär'lan, ALEXANDER (1851–1913). An American mathematician, born at Blairgowrie, Scotland. In 1875 he graduated M.A. from the University of Edinburgh, where he was instructor in physics (1874–76) and examiner in mathematics (1881–84). He was professor of mathematics at the University of Texas in 1885–94, and in 1897 became lecturer on mathematical physics at Lehigh. His publications include: *Algebra of Logic* (1879); *Physical Arithmetic* (1885); *Elementary Mathematical Tables* (1889); *Papers on Space Analysis* (1894); *Bibliography of Quaternions and Allied Mathematics* (1904).

MACFARLANE, CHARLES (?–1858). A Scottish author. From 1816 to 1827 he lived in Italy, and in 1827–28 he was in Constantinople. In 1829 he settled in London as a miscellaneous writer. Subsequently he again traveled in Italy and Turkey. He died, a poor brother, at the Charterhouse, Dec. 9, 1858. To Knight's *Pictorial History* (1838–44) he contributed the *Civil and Military History of England* (8 vols., 1838–44), afterward abridged as the *Cabinet History of England* (1845–47). He wrote popular biographies of Marlborough (1852), Napoleon (1852), and Wellington (1853), and several historical novels, as the *Armenians* (1830) and *Old England Novelettes* (1846–47).

MACFARLANE, ROBERT (1734–1804). A Scottish author and editor. He was educated at Edinburgh and was for a time editor of the London *Morning Chronicle*. He was the author of a Latin translation of the first book of Ossian's *Temora* (1769). Volumes i and iv of the *History of the Reign of George III* (1770–96), published by Evans, are also by him.

MACFARREN, măk-făr'en, GEORGE ALEXANDER (1813–87). An English composer, the son of George Macfarren the dramatist. He was born in London and, after having studied music for two years with Lucas, entered in 1829 the Royal Academy of Music. Upon leaving there in 1836 he taught music at a school in the Isle of Man, but returned to the Academy the next year and was appointed professor of harmony. In 1844 he founded the Handel Society and in 1845 became conductor at Covent Garden. In 1875 he succeeded William Sterndale Bennett as principal of the Royal Academy of Music and the same year became professor of music at Cambridge University. His death occurred at London. As a composer, his works lacked inspiration. His theoretical treatises, however, are clear and forceful presentations of his views on harmony and composition. His compositions include nine operas, four oratorios, eight symphonies, seven overtures, and much sacred music. Of his writings, *Rudiments of Harmony* (1860), *Six Lectures on Harmony* (1867), and *Counterpoint* (1879) are important. Consult H. A. Banister, *G. A. Macfarren: His Life, Works, and Influence* (London, 1891).

McFIN'GAL. A satirical political poem, in the metre of Butler's *Hudibras*, by John Trumbull—the first part published in 1775, the whole in 1782.

MacFLECK'NOE, OR A SATIRE ON THE TRUE BLUE PROTESTANT POET, T. S. A poem by Dryden, published in 1682, in which Thomas Shadwell is depicted as the adopted son and heir of Richard Flecknoe, an Irish priest, famous for his bad verses. The satire was imitated by Pope in his *Dunciad*.

McFLIM'SEY, FLORA. The heroine of William Allen Butler's *Nothing to Wear* (q.v.).

MacGAHAN, măk-gä'han, JANUARIUS ALOYSIUS (1844–78). An American journalist and traveler, born in Lexington, Ohio. As a correspondent of the New York *Herald* (1870–71), he was with Bourbaki's army in the Franco-Prussian War, went to Lyons and Bordeaux, and attracted much attention by his interviews with republican, monarchical, and clerical leaders. He was the only newspaper correspondent in Paris during the whole period of the Commune, and he narrowly escaped death. He afterward visited Russia as *Herald* correspondent, accompanied the expedition to Khiva, contrary to Russian orders, and told his experience in *Campaigning on the Oxus* and *The Fall of Khiva* (1874). He had already reported the Alabama Conference at Geneva and accompanied General Sherman to the Caucasus. He reported the Carlist War in Spain (1874) and made a Polar voyage (1875), described in *Under the Northern Lights* (1876). He then investigated as a journalist the Bulgarian atrocities, accompanied by the United States Commissioner, Eugene Schuyler (q.v.). His *Turkish Atrocities in Bulgaria* (1876) helped to free the hands of Russia for the Turkish War. He accompanied the Russian army, though crippled by accidents, and gave the most vivid picture of the fighting at Shipka and Plevna. He was preparing to attend the International Congress at Berlin (1878) when he died of fever at Constantinople.

McGEE, m'-gē', ANITA NEWCOMB (1864–). An American physician. A daughter of Prof. Simon Newcomb, she was born in Washington and was educated in that city and in Europe. In 1888 she married the ethnologist, W J McGee (q.v.), and four years afterward received the degree of M.D. from Columbian (now

George Washington) University, Washington. She originated and was director of the Hospital Corps of the Daughters of the American Revolution, which chose the trained women nurses during the Spanish-American War. In August, 1898, as acting assistant surgeon, she became the only woman officer of the army. She organized and administered an army nurse corps numbering over 1000. She resigned on completion of this work, Dec. 31, 1900, when the corps was by act of Congress made a permanent part of the army. In 1904 she took a party of American trained nurses to serve with the Japanese army and was appointed supervisor of nurses by the Japanese Minister of War. She lectured on hygiene at the University of California in 1911.

McGEE, THOMAS D'ARCY (1825–68). A Canadian statesman and author. He was born in Carlingford, Ireland, emigrated to America when 17 years of age, and settled in Boston, Mass., where he became editor of the *Pilot*. He returned to Ireland in 1845, and until 1848 he remained an editor of the Dublin *Nation*. Again, fearing arrest, he crossed the ocean and became proprietor and editor of the New York *Nation*. His criticisms of the Catholic clergy for dissuading the Irish from rebellion were so severe that Archbishop Hughes procured the suppression of his newspaper. McGee then went again to Boston and established the *American Celt* in 1850; but a change came in his political views, and he gradually relinquished his revolutionary doctrines. In 1857 he changed his residence to Canada, established the *New Era* in Montreal, and began an active political career. He was elected a member of the House of Commons, in which he retained a seat until his death. He was President of the Council in 1862 and Minister of Agriculture in 1864. A remarkable natural orator, his speeches in 1864–66 in favor of confederation were, from the point of view of patriotic and emotional appeal, the strongest made in support of that movement. He was a delegate to the Charlottetown and Quebec conferences (1864). He denounced Fenianism; but he was in turn hated by its baser adherents in the United States and Canada, who had recklessly supported the crude political projects of his youth. By one of these men he was shot dead shortly after making a brilliant parliamentary speech.

McGEE, W J (1853–1912). An American geologist, anthropologist, and ethnologist. He was born near Dubuque, Iowa, and devoted his earlier years partly to reading law and to surveying, partly to improving agricultural implements, several of which he patented. He began the study of archæology and geology in 1875 and in 1877–81 executed a topographic and geological survey of 17,000 square miles in northeastern Iowa. In 1881 he was appointed geologist on the United States Geological Survey, and in 1885 and 1892 compiled standard geological maps. Having resigned from the Geological Survey, he was ethnologist in charge in the Bureau of American Ethnology from 1893 to 1903. In 1895 he explored the Isla del Tiburon, Gulf of California, home of the Seri Indians. In 1904 he was chief of the department of anthropology at the St. Louis Exhibition. He served as acting president of the American Association for the Advancement of Science (1897–98), and as president of the American Anthropological Association (1902–12), and the National Geographic Society (1904–05). His publications include: *The Pleistocene History of Northeastern Iowa* (1889); *The Geology of Chesapeake Bay* (1888); *The Siouan Indians* (1895); *Primitive Trephining* (1897); *The Seri Indians* (1899); *Primitive Numbers* (1901); *Soil Erosion* (1911); *Wells and Subsoil Water* (1913). He was also a contributor to the NEW INTERNATIONAL ENCYCLOPÆDIA.

McGIFFERT, m'-gĭf′fẽrt, ARTHUR CUSHMAN (1861–). An American theologian and author, born at Sauquoit, N. Y. He graduated at Western Reserve in 1882 and at Union Theological Seminary in 1885. Afterward he continued his studies in Germany at the universities of Berlin and Marburg and in Paris and Rome and was ordained to the Presbyterian ministry in 1888. He became instructor in Church history at Lane Seminary in 1888 and professor there in 1890. He held this position until he was appointed professor of Church history at Union Seminary in 1893. Dr. McGiffert's book, *A History of Christianity in the Apostolic Age* (1897; rev. ed., 1900), was much criticized, and he withdrew from the Presbyterian ministry in order to avoid an almost inevitable trial for heresy. He retained his position at Union and joined the Congregational church. He also wrote: *Dialogue between a Christian and a Jew* (1888), his doctor's thesis; a translation of Eusebius' *Church History* (1890), with prolegomena and notes; *The Apostles' Creed* (1902); *The Christian Point of View* (1902), with Francis Brown and G. W. Knox; *Protestant Thought before Kant* (1911); *Martin Luther, the Man and his Work* (1911); *The Rise of Modern Religious Ideas* (1915), based on the Earl Lectures of 1912 at Pacific Theological Seminary.

McGIFFIN, m'-gĭf′fĭn, PHILO NORTON (1863–97). An American naval officer, born in Pennsylvania. He graduated in 1882 at the United States Naval Academy and at the outbreak of the war between China and France resigned from the navy to enter the Chinese service. In 1887 he succeeded in founding the naval college at Wei-hai-wei, of which he took charge in company with Lieutenant Bouchier of the British navy. During the China-Japan War he became commander of the Chinese fleet at the battle of Yalu River. His vessel scarcely escaped destruction, and he himself was severely injured.

McGILL′, JAMES (1744–1813). The founder of McGill University, Montreal, born in Glasgow, Scotland, Oct. 6, 1744. He went to Canada about 1770, and there he eventually made a fortune in the fur trade and in business at Montreal. He was for a long while a member of the Parliament of Lower Canada and afterward of the legislative and executive councils. In the War of 1812 he was brigadier general of the militia. He died in Montreal, Dec. 19, 1813. In his will he left £10,000 and certain lands for a college to bear his name. The institution founded under this bequest was erected into a university by royal charter in 1821.

McGILL COLLEGE AND UNIVERSITY. An institution of learning in Montreal, Canada, founded under a bequest of Hon. James McGill in 1821 and reorganized by an amended charter in 1852. The university has five faculties: arts, admitting women, mainly in separate classes and conferring the degrees of B.A., M.A., B.Sc., M.Sc., D.Sc., Litt.D., and Ph.D.; applied science, conferring the degrees of B.Sc., M.Sc., and D.Sc.;

law, conferring the degrees of B.C.L. and D.C.L.; medicine, conferring the degrees of M.D. and C.M.; and agriculture, conferring the degree of B.S.A. It stands at the head of a group of affiliated colleges and schools and is itself affiliated with the universities of Oxford, Cambridge, and Dublin. The supreme authority of the university is vested in the crown and is exercised by the Governor-General of Canada as visitor. The highest academic body is the corporation, composed of the governors, principal, and fellows. The governors, 19 in number, are the members of the Royal Institution for the Advancement of Learning. The president of the board of governors is ex-officio chancellor. The principal is the academic head and chief administrative officer and is ex-officio vice chancellor. The fellows, 43 in number, are selected with reference to the representation of all the faculties of affiliated colleges and of other bodies. The university had a total attendance, in 1913, of 2117 students and a faculty of 180. The library contained 144,000 volumes. The endowment of the university was $8,777,845, its grounds and buildings were valued at $8,384,967, and its gross income was about $816,000. The principal in 1914 was W. Peterson.

MACGILLICUDDY REEKS, m'-gĭl′lĭ-kŭd'-dĭ rēks. A group of mountains in the southwestern part of Ireland. They rise from the western shores of the Lakes of Killarney to the height of 3414 feet, being the highest peaks in the island, and are noted for the beauty of their scenery.

McGILLIVRAY, m'-gĭl′ĭ-vrā, ALEXANDER (c.1740–93). A noted chief of the Creek Indians, the son of a Scottish trader by a half-breed woman. He was well educated at Charleston and was afterward placed by his father with a mercantile firm in Savannah, where he remained but a short time, when he returned to the Creek country and became a partner in the firm of Panton, Forbes, and Leslie, which had almost a monopoly of the Creek trade. On the death of his mother, who came of ruling stock, he succeeded to the chiefship, but refused to accept it until called to it by a formal council, when he assumed the title of Emperor of the Creek Nation. His paternal estates having been confiscated by Georgia on the outbreak of the Revolution, he joined the British side with all his warriors and was a prominent instigator in the border hostilities until 1790, when he visited New York with a large retinue and made a treaty of peace with the United States on behalf of his tribe. In accordance with special instructions from Washington to do everything possible to secure his influence for the United States, he and his party were entertained by the Tammany Society, while McGillivray was persuaded to resign his commission as colonel in the Spanish service for the commission of major general in the service of the United States. He continued to rule as principal chief of the Creek nation until his death.

McGillivray's character exhibits a curious mixture of Scottish shrewdness, French love of display, and Indian secretiveness. At his residence in Little Talâssee, on the Coosa, a few miles above the present Wetumpka, Ala., he kept a handsome house with extensive quarters for his negro slaves. In the Indian wars McGillivray tried, so far as possible, to prevent unnecessary cruelties, being noted for his kindness to captives, and his last work was an effort to bring teachers among his people. On the other hand, he conformed much to the Indian custom and managed his negotiations with England, Spain, and the United States with such adroitness that he was able to play off one against the other, holding commissions by turn in the service of all three.

McGILLIVRAY, WILLIAM (1796–1852). A Scottish naturalist, born at Old Aberdeen. He graduated M.A. at King's College, Aberdeen, in 1815, and devoted himself to his favorite study of natural history. In 1823 he was appointed keeper of the museum of Edinburgh University and in 1831 received a similar appointment in the Royal College of Surgeons, Edinburgh. In 1841 he was appointed professor of natural history in the University of Aberdeen. His writings include: *Systematic Arrangement of British Plants* (1830; 10th ed., 1858); *History of British Birds* (5 vols., 1837–52), his great work; and *A Manual of British Ornithology* (2 vols., 1840–42). His edition (the 6th, enlarged, 1845) of Thomas Brown's *Conchologists' Text-Book* was much used.

McGILVARY, m*a*k-gĭl′vȧ-rĭ, EVANDER BRADLEY (1864–). An American philosophical scholar, born in Bangkok, Siam. He came to the United States to study, graduating from Davidson College (N. C.) in 1884 and from Princeton University (A.M.) in 1888, and in 1889–90 held a fellowship at Princeton Theological Seminary. From 1891 to 1894, under the direction of the Presbyterian Board of Foreign Missions in Siam, he translated into the Lao dialect Matthew, Luke, John, and the Acts of Apostles. For five years (1894–99) he taught at the University of California, where he received the degree of Ph.D. in 1897; in 1899 he became Sage professor of ethics at Cornell and in 1905 professor of philosophy at the University of Wisconsin. He served as president of the Western Philosophical Association in 1910–11 and as president of the American Philosophical Association in 1912–13. Besides contributing to various philosophical journals and to the *International Year Book*, he had charge of the department of philosophy of the NEW INTERNATIONAL ENCYCLOPÆDIA, first and second editions.

McGLYNN′, EDWARD (1837–1900). An American Roman Catholic clergyman. He was born in New York, Sept. 27, 1837, of Irish parents. He was educated at the Propaganda in Rome, was ordained there, and in 1866 became pastor of St. Stephen's Church in New York, but in 1886 was removed by the Archbishop, on account of his opposition to parochial schools, and especially because of his persistent advocacy of Henry George's single-tax theories, which were declared at variance with Roman Catholic teachings. He was soon after summoned to Rome to give an account of himself, but he refused to go. On the contrary, he boldly advocated in public the doctrine "no politics from Rome." In July, 1887, he was excommunicated. He then aided in founding the Anti-Poverty Society and became its president (1887). In December, 1892, after a hearing before the Apostolic Delegate, Monseigneur Satolli, he was absolved and restored to his priestly functions. He was in charge of a parish at Newburgh, N. Y., until his death, Jan. 7, 1900.

MacGRATH, m*a*-grăth′, HAROLD (1871–). An American novelist, born in Syracuse, N. Y. After 1890 he devoted himself to literary work and journalism. Among his novels are: *Arms and the Woman* (1899); *The Grey Cloak* (1903); *The Man on the Box* (1904); *Hearts and Masks* (1905); *Half a Rogue* (1906); *The Goose Girl* (1909); *The Carpet from Bagdad* (1911); *Deuces Wild* (1913); *Adventures of Kathlyn* (1914); *The Voice in the Fog* (1915).

McGRATH, Patrick Thomas (1868–). A British-American journalist. He was born at St. John's, Newfoundland, and was educated at the Christian Brothers' School there. He early began newspaper work, which he continued after entering the civil service. He was assistant clerk of the Newfoundland House of Assembly (1898–1900) and became chief clerk in 1907. He was appointed editor of the St. John's *Evening Herald*, and in 1894 became Newfoundland correspondent of the London *Times* and represented the Reuter Telegraph Company and the Associated Press. His numerous newspaper and magazine articles made him an authority on the French shore question, the Atlantic fisheries dispute, Hudson Bay, Arctic exploration, and many other similar topics which closely affected Newfoundland and concerned diplomatic negotiations with France, the United States, and Canada. He published *Canada and the Empire* (1912).

McGREADY, m'-grā'dĭ, James (c.1760–1817). A Presbyterian minister and revivalist. He was born in western Pennsylvania. After a course of study preparatory to entering the ministry in the school of Dr. John McMillan, of Cannonsburg, Pa., he was licensed to preach in 1788. He then labored as a minister in North Carolina and in 1796 removed to southwestern Kentucky. The great revival of 1800, which marked an epoch in the religious history of the region west of the Alleghanies, began under his ministrations. He introduced camp meetings. His employment as preachers of young men not ordained and without education aroused opposition in the Presbyterian church, one of the consequences of which was the organization of the Cumberland Presbyterian church. He was censured by his Presbyterian brethren, but ultimately made his peace with the church and returned to his former presbytery. A collection of his sermons was published after his death (vol. i, Louisville, 1831; vol. ii, Nashville, 1833). Consult: Edson, *Early Presbyterianism in Indiana* (1898); Smith, *History of the Cumberland Presbyterian Church;* Foote, *Sketches of North Carolina, Historical and Biographical* (New York, 1850; 2d series, 1855); Davidson, *History of the Presbyterian Church in the State of Kentucky, etc.* (New York, 1847).

MacGREGOR, mak-grĕg'ẽr, James (1832–1910). A minister of the Church of Scotland, born at Brownhill, Scone, Perthshire. He studied at St. Andrews University in 1848–55, was licensed to preach by the Perth presbytery, and held his first charge at Paisley in 1855–62. He was then minister of the parish of Monimail, Fifeshire (1862–64); and in 1864–68 he established his reputation as a preacher while pastor of the Tron Church, Glasgow. Moving to Edinburgh, he was there pastor of the Tron Church (1868–73) and thereafter until his death first minister of St. Cuthbert's Parish. In 1891 he was moderator of the General Assembly of the Church of Scotland. The most popular Scottish preacher of his day, he became chaplain in ordinary to Queen Victoria in 1886, to Edward VII in 1901, and to George V in 1910.

McGREGOR, John (1797–1857). A Scottish author and statistician, born at Drynie, Ross-shire. After spending some time in Canada he returned to England and in 1828 published *Historical and Descriptive Sketches of the Maritime Colonies of British North America.* After much traveling on the Continent in quest of statistics he again settled in England and was a member of Parliament (1847). He was the principal promoter of the Royal British Bank and became dishonorably connected with its failure, shortly before which event he absconded. He died in Boulogne. An ardent free trader, his parliamentary reports, *Commercial Tariffs and Regulations of the Several States of Europe and America* (8 vols., London, 1841–50), were a severe blow to protection. He was a voluminous and vigorous writer on history, politics, and finance, as well as a statistician. Notable among his works, in addition to those already mentioned, are: *Commercial and Financial Legislation of Europe and America* (1841); *A Digest of the Productive Resources, etc., of All Nations* (1844–48); *History of the British Empire from the Accession of James I* (1852).

MacGREGOR, John (1825–92). An English traveler and writer, commonly known as "Rob Roy." He was born at Gravesend, graduated at Trinity College, Cambridge, in 1847, and was called to the bar at the Middle Temple in 1851. In 1849–50 he made a tour of Europe, Egypt, and Palestine, and afterward visited every European country, as well as Algeria, Tunis, the United States, and Canada. In 1865, in a canoe of his own design and make, he accomplished through European rivers and lakes a voyage of which he gave an account in *A Thousand Miles in the Rob Roy Canoe* (1866). There followed other voyages of the same kind, of which we have record in *The Rob Roy on the Baltic* (1867), *A Voyage Alone in the Yawl Rob Roy* (1867), and *The Rob Roy on the Jordan* (1869) —books deserving the enthusiastic reception which they met. MacGregor illustrated his own text by sketches, and had early contributed drawings to *Punch* and other periodicals. He was active in various philanthropies and in religious work, to which he gave the entire profits of his literary work.

McGUF'FEY, William Holmes (1800–73). An American educator. He was born in Washington Co., Pa.; graduated at Washington College, Pa., in 1825; was a professor first of ancient languages and later of moral philosophy in Miami University in 1836–39; was president of Ohio University in 1839–43; and professor of moral philosophy in the University of Virginia from 1845 until his death. He compiled the so-called "Eclectic Series," a series of readers and other schoolbooks, of which immense numbers were sold.

McGUIRE, *ma*-gwīr', Hunter Holmes (1835–1900). An American surgeon, born at Winchester, Va. He graduated from the Winchester Medical College in 1855 and from the Medical College of Virginia in 1858. In the Civil War he was a Confederate medical director under Generals Stonewall Jackson, Ewell, and Early; and, when Jackson was dying in 1863, McGuire was constantly in attendance. From 1865 to 1878 he was professor of surgery at the Medical College of Virginia. Attaining distinction in his profession, he served as president of the American Surgical Association in 1886 and of the American Medical Association in 1893.

MACH, mäG, Edmund (Robert Otto) von (1870–). A German-American writer and lecturer on art. He was born at Gaffert, Pomerania, Germany, came to America in 1891, and was educated at Harvard University (A.B., 1895; A.M., 1896; Ph.D., 1900), where he was an instructor in fine arts from 1899 to 1903. He was also an instructor in the history of art at Wellesley College from 1899 to 1902, and thereafter lectured on the same subject at Bradford Academy. He is the author of *Greek Sculpture: Its Spirit and Principles* (1903); *A Handbook of Greek and Roman Sculpture* (1904); *Outlines of the History of Painting* (1905); *The Art of Painting in the Nineteenth Century* (1908). Of the *Allgemeines Lexikon der bildenden Künstler* he became American editor. After the outbreak (1914) of the European War he endeavored to foster a pro-German sentiment among Americans, and with this object in view wrote *What Germany Wants* (1914) and translated Paul Rohrbach's *Der Deutsche Gedanke in der Welt* as *German World Politics* (1915). In March, 1915, he debated questions of the war with Cecil Chesterton at Carnegie Hall, New York.

MACH, Ernst (1838–1916). An Austrian physicist and psychologist, born at Turas, Moravia, and educated in Vienna. He was made professor of mathematics at Graz in 1864 and in 1867 professor of physics at Prague, where he was rector magnificus in 1879–80. After holding the chair of physics at the University of Vienna for six years (1895–1901) he retired from academic activities and was appointed a member of the Austrian House of Peers. For many years a close student of pure physics, devoted especially to problems of light, sound, and electricity, he later began to write on the history and philosophy of physics and, following out logically the new mechanical theories of time and space, to correlate modern physics with psychology; he thus arrived at a theory of knowledge which has much in common with the empirio-criticism of Avenarius: see especially *Beiträge zur Analyse der Empfindungen* (1886), known after the fourth edition (1903) as *Die Analyse der Empfindungen und das Verhältnis des Physischen zum Psychischen* (6th ed., 1911; Eng. trans. by C. M. Williams, *The Analysis of Sensations, and the Relation of the Physical to the Psychical*, 1897; rev. and suppl. from 5th Ger. ed. by S. Waterlow, 3d ed., 1914). This work was widely discussed in Germany, as was Mach's *Principien der Wärmelehre* (1896; 3d ed., 1913), equally suggestive by reason of its treatment of the general method of natural science. Mention should be made also of *Compendium der Physik für Mediziner* (1863); *Die Geschichte und die Würzel des Satzes von Erhaltung der Arbeit* (1872; 2d ed., 1909; Eng. trans. by P. E. B. Jourdain, *History and Root of the Principle of the Conservation of Energy*, 1911); *Lehre von den Bewegungsempfindungen* (1875); *Die Mechanik in ihrer Entwickelung* (1883; 7th ed., 1912; Eng. trans. by T. J. McCormack, *The Science of Mechanics*, 1893; 3d ed., 1902); *Populärwissenschaftliche Vorlesungen* (2d ed., 1897; 4th ed., 1910; Eng. trans. by McCormack, *Popular Scientific Lectures*, 1895). In *Erkenntnis und Irrtum* (1905) Mach sets forth in detail his views of the psychology of knowing and of scientific methodology, and expresses his mature convictions regarding the biological, psychological, and social significance of science. Consult Paul Carus, "Professor Mach and his Work," in *The Monist*, vol. xxi (Chicago, 1911).

MACHÆRODUS, ma̍-kē′rô-dŭs (Neo-Lat., from Gk. *μάχαιρα*, *machaira*, sword, sabre + *ὀδούς*, *odous*, tooth). A fossil ancestor of the cat family, having enormous upper canine teeth, found in deposits of late Tertiary age in North America, South America, Asia, and Europe. See Sabre-Toothed Tiger.

MACHÆRUS, ma̍-kē′rŭs (Lat., from Gk. *Μαχαιροῦς*, *Machairous*). A strong fortress of Perea (Map: Palestine, D 4). Josephus (*Wars*, vii, 6, 2) says it was originally a tower built by Alexander Jannæus as a check to the Arab marauders. It was on a lofty point, surrounded by deep valleys, and of immense strength. Gabinius captured it from the grandson of Alexander Jannæus and destroyed it (*Ant.* xiv, 5, 4), but it was again fortified by Herod (*Wars*, vii, 6, 2), who used it as one of his principal residences. On the death of Herod it passed to Antipas, by whose order John the Baptist was imprisoned here and finally put to death (*Ant.* xviii, 5, 2). After the fall of Jerusalem it was occupied by the Jewish banditti, but it was finally captured (72 A.D.) by the Romans and razed (*Wars*, vii, 6, 1–4). Pliny calls Machærus the second citadel of Judæa (*Histor. Nat.* v, 16, 72). Its site was identified by Seetzen with the extensive ruins now called Mkaur on a rocky spur jutting out from Jebel Attarus towards the north and overhanging the valley of Zerka Main. Consult G. A. Smith, *Historical Geography of the Holy Land* (16th ed., London, 1910).

MACHAR, ma̍-kär′, Agnes Maule (?1856–). A Canadian author. She was born and educated in Kingston, Ontario, and at an early age began to contribute in prose and verse to American and Canadian periodicals. Her publications include: *For King and Country; Katie Johnson's Cross; Lucy Raymond; Lost and Won; Stories of New France* (1890); *Marjorie's Canadian Winter* (1891); *Roland Graeme, Knight* (1892); *Lays of the True North* (1899), poems; *Stories of Old Kingston* (1908); *Stories of the British Empire* (1913).

MACHAULT, ma̍′shō′, or **MACHAUT**, Guillaume de. A French poet and musician. See Guillaume de Machault.

McHENRY, măk-hĕn′rĭ, James (1753–1816). An American military surgeon and politician, born at Ballymena, County Antrim, Ireland. He studied for a time at Dublin, but about 1771 removed to America and soon afterward began the study of medicine under Dr. Rush (q.v.) in Philadelphia. He joined the Continental forces at the outbreak of the Revolution and was appointed surgeon of the Fifth Pennsylvania Battalion in 1776; was taken prisoner at Fort Washington in November of the same year, but was released on parole in January, 1777, and was exchanged in March, 1778. He became assistant secretary to Washington the following May and in October, 1780, was transferred to the staff of General Lafayette with the rank of major. In 1781 he was elected to the Maryland Senate, of which he continued a member until 1786, although he was, during the last three years, also a delegate to the Confederation Congress. In 1787 he was elected to the Constitutional Convention, in 1789 to the General Assembly, and from 1791 till 1796 was in the Maryland Senate. In the latter year he accepted the appointment of Secretary of War in Washington's cabinet, a position which he continued to hold in Adams's cabinet until 1800. He was a strong Federalist and favored a vigorous policy in strengthening the army and navy. He notified Washington of his appointment as commander in chief in 1798 at the time of the trouble with France, and was one of the most active members of the cabinet in advocating Hamilton's appointment to the place of second in command. His partisanship in favor of Hamilton finally led President Adams to request his resignation. He then retired to Maryland, where he lived during the remainder of his life. Fort McHenry (q.v.) was named in his honor.

McHENRY, James (1785–1845). An American physician and author, born at Larne, County Antrim, Ireland. He studied at Dublin and Glasgow and then practiced for a time in Ireland, but in 1817 emigrated to the United States. In 1842 he was appointed United States Consul at Londonderry, a post he held until his death. His writings include: *O'Halloran, or the Insurgent* (1824); *The Wilderness, or Braddock's Times: A Tale of the West* (2 vols., 1823); *The Betrothed of Wyoming* (2d ed., 1830); *Jackson's Wreath* (1829); *The Usurper, an Historical Tragedy,* which was played at the old Chestnut Street Theatre in Philadelphia in 1829.

MACHÉ UNIT. See Radium.

MACHIAS, mȧ-chī′*a*s. A town and the county seat of Washington Co., Me., 89 miles by rail east by south of Bangor, on the Machias River, 12 miles from its mouth and at the head of navigation, and on the Washington County Railroad (Map: Maine, E 4). It has a fine courthouse, jail, Federal government building, United States Marine Hospital, Washington State Normal School, the Porter Memorial Library, and Sylvan Park. Machias is chiefly engaged in shipbuilding and lumber manufacturing and in the coastwise and lumber trade. There is good water power. Pop., 1900, 2082; 1910, 2069.

In 1633 several Englishmen established a trading post here, but the French forced them to leave in the same year, and the post was removed. Machias was settled in 1763, became a township in 1770, and was incorporated as a town in 1784. From Aug. 1 to Nov. 1, 1777, it was besieged, and on Aug. 17 it was unsuccessfully attacked by a small British fleet under Sir George Collier. Out of the original township East Machias, Machiasport, Whitneyville, and Marshfield were subsequently created. Consult *Memorial of the Centennial Anniversary of the Settlement of Machias* (Machias, 1863).

MACHIAVELLI, mä′kyȧ-vĕl′lê, Niccolò (1469–1527). An Italian historian, statesman, and man of letters. He was born in Florence, May 3, 1469, the second of four children of Bernardo Machiavelli and Bartolomea dei Nelli. His family belonged to the Tuscan nobility, but for some time had been poor in worldly goods. Of his early life we have little authentic information. He had the literary education of a well-born Florentine of his day, knew some law, wrote Latin readily, but had no acquaintance with Greek. His abundant knowledge of later years was the result of private study, thought, and observation of men and events. In 1494 he obtained a post in the Second Chancellery of Florence, comprising the bureaus of Foreign Affairs and War. This was at the time of the expulsion of the Medici and the establishment of a new republican government under the auspices of Savonarola. He became first Secretary of the Ten in 1498, and held the position for 14 years. The office was more responsible and important than lucrative, and Machiavelli was throughout his life a poor man. The Republic of Florence did not even supply funds for the necessary expenses of the many diplomatic missions upon which he was sent, and these were a heavy drain upon his slender private resources. We have slight glimpses into his family life. He married Marietta Corsini in 1502 and she bore him six children. His principal modern biographer describes him as "of middle height, slender figure, with sparkling eyes, dark hair, rather a small head, a slightly aquiline nose, a tightly closed mouth. All about him bore the impress of a very acute observer and thinker, but not that of one able to wield much influence over others." The position of Machiavelli in public life was a peculiar one. He was never a leader; but he was for many years in positions of trust and responsibility and intimately associated with the most important business of government and with the chief men of the period. He had, therefore, unique opportunities for impartial study of the business of government. The Pisan war laid upon him diplomatic duties, as well as those of commissary of the forces. In the latter capacity he was able to study the system of mercenary military service then in vogue, and thereafter he actively opposed the mercenary system in favor of a national military organization, such as all nations maintain to-day. He spent much time on diplomatic duty at the court of Cesare Borgia and saw the rise and fall of the power of that master of sinister and conscienceless politics. A study of Cesare's methods, embodied in the essay *On the Mode of Treating the Rebels in the Val di Chiana,* was the first attempt at a new science of politics. The embassies of Machiavelli also included one to the Emperor Maximilian I, two to Pope Julius II, four to Louis XII of France, and many to the various Italian states. His letters and papers relating to these constitute an invaluable notebook upon the political conditions of the period.

The Florentine ship of state sailed in troubled waters in the years 1510–12 and soon, deserted by its allies, the Republic was left to fight its battle alone against the exiled Medici, backed by the papal power. Machiavelli worked with energy for the defense of the city, but with the overthrow of the Republic was involved in the downfall of his friend and patron, the Gonfaloniere Soderini (1512). As the Medici showed great moderation upon their restoration, Machiavelli seems to have entertained hope of returning to his office, the income of which he needed, while the work suited his taste. He was, however, dismissed and banished for a year from the city, but without permission to leave Florentine territory, and put under bonds. It is worthy of note that he was able to render exact and correct accounts upon relinquishing his office. In 1513 he was arrested on suspicion of complicity in the conspiracy of Boscoli and Capponi, but after being put to the torture he was adjudged innocent. Reduced to want and deprived of wholesome activities, he abandoned himself to debauchery and wrote verses and comedies, of which the best known is *Mandragola.* He soon turned, however, to a better task, and wrote his great works on politics—*Il principe* and *Discorsi sopra la prima deca di Tito Livio.* Before 1520 Machiavelli gave *The Prince* its final form, and wrote all that was ever written of the *Discourses* and the seven books on the *Art of War*. Some favor now began to be shown him. He was admitted to the company that gathered in the Oricellari Gardens, and ventured to put forth a *Discourse Touching the Reform of Government in Florence*, advocating the reëstablishment of the Republic. He was commissioned by the directors of the Studio Publico, chiefly through the influence of Cardinal Giulio de' Medici (to whom as Pope Clement VII the work was dedicated), to write a history of Florence. For this work, the *Istorie fiorentine*, he received a yearly stipend of 100 florins. He was thus actively engaged in literary work during his later years, and in 1521 he resumed official work for the state and was again employed on diplomatic missions in Italy. Returning to Florence from one of these absences in May, 1527, he became ill and died, June 22. His body was buried in the family vault in the church of Santa Croce, and in 1787, through the efforts of Earl Cowper, a monument was erected to his memory over his tomb.

Machiavelli's life was full of disappointments and he was not one of those idealists who could live above and apart from the things of this world. He was preëminently a man of affairs, whose studies and activities were inseparably connected with human society in its most active phases. It is as a writer upon history, diplomacy, and politics that he holds a high and important place. In this field his position as a man of letters and as a thinker is secure. Here his style is at its best and he imparts to all his work the keen interest that belongs to a direct and vigorous realism. As a historian, he is not critical in the treatment of his material, but in other respects he belongs to the modern historical school, his discriminating philosophical method marking a sharp breaking away from the mediæval type of chronicler and a return to the models of the classical historians. His principal historical work was the *History of Florence*, in eight books, beginning with the Germanic invasions and continuing down to the death of Lorenzo de' Medici. More useful, however, to the student to-day are his numerous reports upon his diplomatic missions and the brief papers on foreign affairs growing out of them. The unfinished *Life of Castruccio Castracani* is of little value.

Aside from the notes on diplomacy and politics contained in his diplomatic papers, Machiavelli's political system is embodied in *The Prince* and the *Discourses*, neither of which is complete without the other. The cynical maxims which abound in them have given the writer an evil reputation which he does not deserve. It must always be remembered that Machiavelli did not discuss ideal but actual conditions, and drew his deductions from the facts acquired by close observation. He thus became the founder of the modern school of scientific politics. Looking at his system in a large way and eliminating the cynicism which his environment naturally produced, we find that much of what he set forth has been adopted by the soundest political science of to-day. Machiavelli had no faith in aristocracies. He recognized but two forms of government as practicable—absolutism and the democratic republic. The latter was his ideal, but the former he believed to be sometimes necessary. As the first exponent of the idea of a united Italy he showed in *The Prince* how that great end might be brought about by efficient leadership. The *Discourses* elaborate the idea of a republic upon the same fundamental principles. He did not believe that the great ends of government in the upbuilding of the state should be sacrificed to abstract ethics. He was the forerunner of the school of political thinkers who divorce ethics and politics, not because they are necessarily in conflict, but because they are distinct sciences. His system in general is one of policy, resting on the inherent imperfection of men and looking to the balance of conflicting evils. It is in no sense a theoretical political philosophy, though it seems to have such a philosophy in view.

Bibliography. Of Machiavelli's writings only the *Art of War* was printed during his life. A few years after his death the *Discourses*, *The Prince*, and *History of Florence* were printed at Rome with the authorization of Pope Clement VII, but Paul IV put them on the Index Expurgatorius, and this was confirmed by the Council of Trent in 1563. Eight years later the Commission on the Index proposed to Machiavelli's descendants to publish an expurgated edition, the author's name being suppressed. This offer was rejected. In 1772 a partial edition in three volumes was published in London, and in 1782 Earl Cowper published a four-volume edition at his own cost. They were not published in Italy until the nineteenth century, when the Milan (1810–11) and the Italia (1813) editions appeared. An admirable English translation of the historical, diplomatic, and political writings is that of Detmold, *The Writings of Niccolò Machiavelli* (Boston, 1891); also "Machiavelli," with an introduction by H. Cust (vol. i, *Art of War;* vol. ii, *The Prince*), in *Tudor Translations*, vols. xxxix, xl (London, 1905). The best biography and commentary on his place in history is by Pasquale Villari, *Niccolò Machiavelli e i suoi tempi* (1877–82; Eng. trans. by Linda Villari, 2 vols., ib., 1892). Consult also: Oreste Tommasini, *La vita e gli scritti di Niccolò Machiavelli* (Turin, 1882); Mourrisson, *Machiavel* (Paris, 1883); Lord Morley, *Machiavelli*, the Romanes lecture (London, 1898); L. A. Burd, in *Cambridge Modern History*, vol. i (Cambridge, 1902), containing a bibliography; F. P. Stearns, *Napoleon and Machiavelli: Two Essays in Political Science* (Cambridge, Mass., 1903); Louis Dyer, *Machiavelli and the Modern State* (Boston, 1904). *The Prince* is published in many languages; for literature relating to it, see Mohl, *Geschichte und Litteratur der Staatswissenschaft* (Erlangen, 1855–58).

MACHINE, MACHINERY (in engineering). See MECHANICAL POWERS—MACHINES; METAL-WORKING MACHINERY; WOODWORKING MACHINERY; ETC.

MACHINE ENGRAVING. A process involving the use of a machine to engrave wood, metal, or stone. Machinery has been devised which will carry on many of the manual operations of an engraver and produce regular tints, geometrical designs, and other symmetrical patterns with greater accuracy and far more rapidity than would be possible by handwork. The first machine of this description was invented by Wilson Lowry and was known as a ruling machine, being employed to engrave such mechanical features of a plate as the plain background, skies, etc. In most machines for engraving the tool is so arranged that after each cut it can be moved a certain definite amount so that at the next stroke a parallel line is cut at a regular distance from the last. In wood engraving the breadth of the tool, or the depth to which it is allowed to cut, regulates the distance between the lines and the nature of the tint. For metal work the machine may be fitted with a highly tempered steel cutting tool, though in the case of engraving copper plates the latter are usually coated with varnish which is scratched by the tool and subsequently etched by acid. In the latter case the intensity of the action of the acid will regulate the thickness of the lines. When it is necessary to engrave on stone with a machine, the cutting tool has a diamond point, and the depth of the cut is regulated by means of weights on the tool holder. The most complex engraving is executed wholly by machinery and is employed in the manufacture of bank notes, bonds, stock certificates, and other papers which it is necessary to protect with a peculiar and individual pattern. By an elaborate system of gearing the cutting tool so moves that it will execute a certain number of symmetrical motions and thus produce elaborate geometrical scrolls and patterns. On such a machine it is possible to make many combinations of figures for a pattern, but it can be made impossible to reproduce any given design once it has been traced. See BANK NOTES, MANUFACTURE OF.

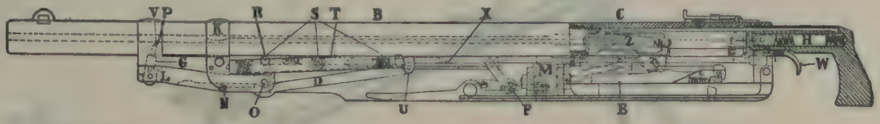
MACHINE GUN (Fr. *machine*, from Lat. *machina*, from Gk. *μηχανή*, *mēchanē*, device). A gun in which the operations of loading, extraction, and firing are wholly or partly performed by mechanism. The early history of machine guns is involved in the same mystery that surrounds the development of guns and gunpowder. The breechloader and the revolver are found almost as far back as we can trace the portable gun; even farther back there is evidence of attempts to produce multiple-firing guns. At the Boston Navy Yard there is a double-barreled bronze gun of Chinese manufacture which was captured in Korea in 1870. According to the Chinese inscription upon it, it was made in 1607. It is about 18 inches long and weighs 14 pounds. It has three reënforcing bands about the breech end of each barrel, and each band has a vent in it. It was therefore arranged to fire in succession three shots from each barrel, the spaces between the vents being ample for the powder, ball, and wads. Pepys in his diary, date of July 3, 1662, says: "After dinner was brought to Sir W. Compton a gun to discharge seven times, the best of all devices that ever I saw, and very serviceable, and not a bauble, for it is much approved of and many thereof made." From 1662 to 1861 there are found frequent references to guns designed for multiple loading, but none seemed to give sufficient satisfaction to gain a permanent place in armaments. The success of the machine gun awaited the development of metal-cased fixed ammunition, which appeared (as a military store) during the American Civil War and was immediately followed by magazine and repeating small arms and numerous kinds of machine guns. Of these early pieces the best was undoubtedly the Gatling, though the Nordenfeldt gun gave satisfaction as a ship's gun. The French mitrailleuse never was very successful; it appeared after the Gatling was practically perfected, but was much inferior to it and owed its reputation to fanciful descriptions of some newspaper correspondents who were ignorant of its actual performance. The first machine gun of a calibre larger than that of small arms was the Hotchkiss revolving cannon. This was invented by Mr. B. B. Hotchkiss, an American residing in France, in 1887, in response to the call of the French naval officers, who wanted a rapid-firing weapon of larger calibre as a defense against torpedo boats. These guns were at first one-pounders, as under the rules of war this is the lightest explosive shell; they were afterward made to fire six-pound shells, but were very cumbersome and were replaced five years later by rapid-firing single-shot weapons. The Maxim-Nordenfeldt automatic one-pounder was first used in the Spanish-American War, but was brought out a year or two before; it is a development of Sir Hiram Maxim's smaller automatic gun, which had been in use for eight or ten years.

Machine guns may be divided into two classes: (*a*) those operated by hand power or exterior force, and (*b*) those operated by the force of the powder gases acting directly upon a piston or through the recoil of the barrel. Representative of the first class are the Gatling and Gardner guns and Hotchkiss revolving cannon, which are not very different in general character, and the Nordenfeldt, which more closely resembles the early forms of mitrailleuse. In the latter the barrels, three or more in number, have their axes in the same horizontal plane, and are fired by a horizontal lever, one after the other, but so rapidly that the piece is included among the so-called *volley-firing* guns.

A description of the Gatling will serve as an illustration of the principle upon which most of the guns of class (*a*) were designed. It was invented by Dr. R. J. Gatling, of Indianapolis, Ind., in 1861, and in 1862 he had a battery constructed and in working order, an accomplishment which certainly preceded the appearance of the French mitrailleuse. The gun consists of a series of parallel barrels, usually 10, in common with a grooved carrier and lock cylinder, the whole rigidly secured upon a main shaft. It has as many grooves in the carrier and as many holes in the lock cylinder as there are barrels. Each barrel has one lock, so that a gun with 10 barrels has 10 locks. The operation of the gun is very simple; one man places one end of a feed case filled with cartridges into the hopper, while a second man turns the crank which by the agency of the gearing revolves the main shaft. As the gun is revolved the separate cartridges drop into the grooves of the carrier from the feed cases and are pressed home ready for discharge. When first invented, the Gatling gun differed radically both in principle and action from any form of gun previously in use, and admitted of faster discharges and heavier projectiles, besides which, its method of fire prevented the accumulation of recoil. Improvements and alterations in the gun have been largely in the direction of an improved feed case.

The objections to the original tin feed case were that it worked irregularly for different angles of elevation, and that the cartridges did not always fall in their proper position in the grooves, with the consequence that jamming frequently occurred. The Bruce feed was designed to remedy this last defect. It was constructed on the gravity principle and consisted of an upright bronze standard to which was attached a swinging piece containing two grooves, beneath which was an opening, which in turn connected with a wheel turning freely on its own axis. In action the cartridges were fed into the opening of the breech cases above the carrier block, where they became engaged in the grooves of the swinging piece and passed directly into the fixed mouth, so that as each cartridge made contact with the wheel the latter was made to revolve by its impact and pressure and thus present the next groove for the next cartridge. As the wheel turned round it carried and deposited the cartridges in the grooves of the carrier block ready for discharge. The device answered its purpose with regard to the avoidance of jamming, but was as variable and uncertain so far as regards the different angles of elevation as was the old tin case.

The Accles feed drum was designed to obviate this difficulty, and as it fed the gun without the aid of gravity, being in effect a positive feeder, it was independent of the angle of elevation. The invention consisted of a two-headed drum, connected by a sheet-brass casing, the heads also being of brass, and the distance between the two equal in length to that of a cartridge. Each head was grooved in a spiral form. The cartridges were inserted in the drum through the mouth and rest in the spirals and between the radial arms. To fire the gun, the feed drum was inserted in position directly over the carrier block, the opening of the drum resting over the grooves of the block with the planes of its heads in position with the axis of the barrels. The movement or rotation of the crank caused the lock cylinder, barrels, etc., to revolve; and at the same time the groove projections of the carrier block forced the radial arms of the drum to rotate. The great objection to this device was that while the feed was perfectly regulated, causing no deviations of elevation, yet the weight of the drum was a serious drawback, besides which, a bullet striking its exposed surface instantly put it out of action. To avoid this very serious defect, a feed has been introduced which leaves but a small surface exposed to fire and is in other respects entirely free from the defects of its predecessors. Long strips of some cheap flexible metal, tin preferably, having tongues or slits (one end of each of the former attached to the strips, while the other is separated, and so surrounds the cartridge as to keep it in position on the strip), are fed into the opening of the hopper. The rotation of the crank compels the projections on the grooves of the carrier block acting upon the cartridges to force the strip through the hopper. Thus each cartridge is in turn deposited in the groove of the carrier block, the empty strips being discharged to the right. The Gatling gun with improved feed has attained a rate of fire of about 20 rounds a second.



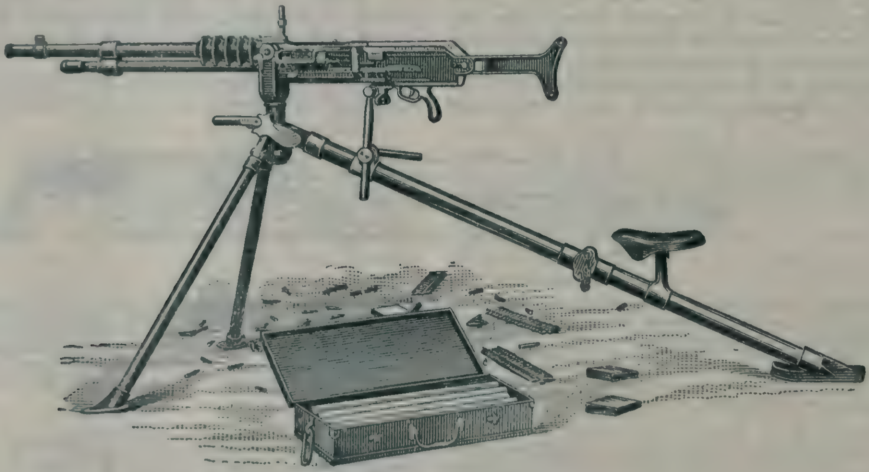
DETAIL OF COLT AUTOMATIC GUN.

B, barrel; *C*, breech casing; *D*, operating rod; *E*, carrier which lifts cartridge in front of breech bolt; *F*, feed mechanism; *G*, gas cylinder in which gas piston (*P*) fits; *H*, hammer; *K*, band around barrel carrying double lugs in which is pivot of gas lever (*L*); *L*, gas lever which is made to vibrate and operate mechanism; *M*, opening in casing for feed belt; *N*, pivot of operating rod (*D*) on gas lever; *O*, gas lever pivot in lugs of band (*K*); *P*, gas piston against which powder gas acts; *R*, short arm on end of gas lever (*L*) to which are attached springs (*S*) to return (*L*) to position after firing; *S*, springs to keep gas lever up; *U*, pivot of operating rod; *V*, vent through which gas escapes; *W*, trigger; *X*, sliding bar which works breech bolt, feed mechanism, and carrier; *Z*, breech bolt.

The Gardner gun closely resembles the Gatling so far as regards the principle of rapid fire. It consists of two barrels parallel to each other and having their axes in the same horizontal plane. Its component parts other than the barrels are the casing, bolts, firing and extracting mechanism, cams, and feed valve and guide. The casing is of bronze and forms a support as well as protection for the barrels. A current of air is caused to circulate around the barrels by means of two openings made in the top and bottom. The rear part of the casing (box-shaped) contains the mechanism. The two U-shaped bolts (one for each barrel) have a backward-and-forward movement in the casing. The firing and extracting mechanism is both simple and ingenious, the feed valve and guide closely resembling the Bruce guide already explained in connection with the Gatling gun, except that it is without a wheel and is attached to the casing in the rear of the barrels. It is so arranged as to cause the cartridges to drop from the feed guide through the holes in the casing and thence into the chamber, into which it is forced by the bolt. This action opens the other barrel, which is loaded in turn, and so on until the ammunition is exhausted.

The guns of class (*b*) that are now in use are (1) fully automatic or (2) semiautomatic. A gun is not automatic if it is operated by the rotation of a spindle worked by hand, clockwork, or by motor, for the evident reason that the operating power is obtained from an outside or external source. But, if the power is derived from the explosion of a preceding cartridge, the gun would come under the heading of automatic machine guns, and thus be differentiated from those operated by a crank worked by hand or a motor machine gun worked by an electric or other motor. The term "semiautomatic" when applied to ordnance is used to denote any gun in which the functions necessary to its employment are performed partly automatically and partly by external agents. The fully automatic guns may be divided into (1*a*) those operated by the powder gas acting upon a piston and (1*b*) those operated by the recoil of the barrel or other parts when the piece is fired. All semiautomatic pieces so far produced are operated by the recoil of the barrel or moving parts. The fully automatic guns of the (1*a*) class are very numerous, but those best known are the Colt (Browning's patent), Hotchkiss, Yamanouchi (Japanese), the Benet-Mercie, or automatic machine rifle, calibre .30, adopted for use in the army and navy of the United States.

The mechanism of the Colt gun is driven by the action of a vibrating lever which is pivoted on the gun and has a short cylindrical lug at its forward end resting in a socket in the casing and covering a hole in the barrel near the muzzle. When the bullet passes beyond the hole in the barrel the pressure of the powder gas acting on the lug throws it back with force sufficient to give power to carry on all the operations of loading and firing. The gun has no water jacket, but the barrel is very heavy (more than an inch in diameter). The cartridges are fed in a belt of woven cotton which carries 250; additional belts may be placed in position with the loss of but a few seconds' time. The Colt gun is being gradually replaced by the Benet-Mercie in the United States navy. The Colt weighs about 40 pounds; calibre .30. The Colt gun is usually mounted on the ship's rail or on the rail of a top. For service in the field a tripod mount weighing 50.25 pounds is supplied. The speed of fire is about 300 rounds per minute, but, owing to the necessity of changing the belt, about 250 is the practical limit.



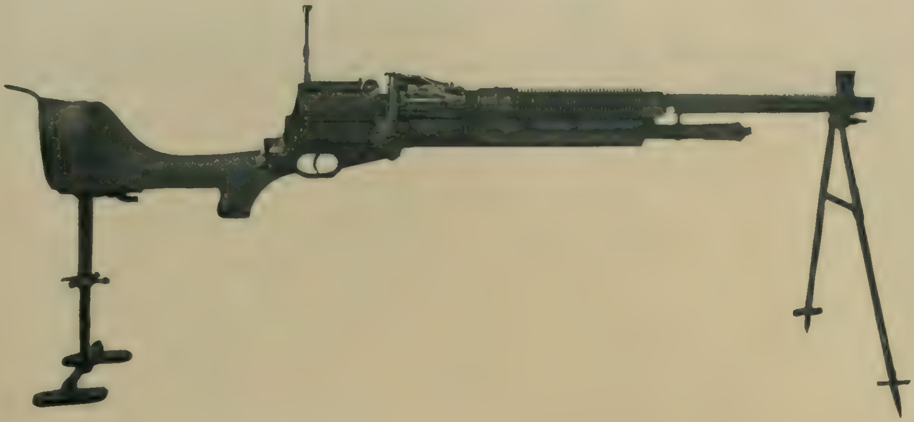
HOTCHKISS RIFLE-CALIBRE AUTOMATIC GUN ON TRIPOD.

The Hotchkiss and Yamanouchi guns differ from the Colt chiefly in the method of utilizing the pressure of the powder gas. Instead of pressing against a vibrating lever, the powder gas escapes from the hole in the barrel into the end of a cylinder underneath and presses back a piston which works the mechanism. As soon as the bullet leaves the muzzle the pressure against the piston is removed and it is free to come forward again and is returned by the action of a spring.

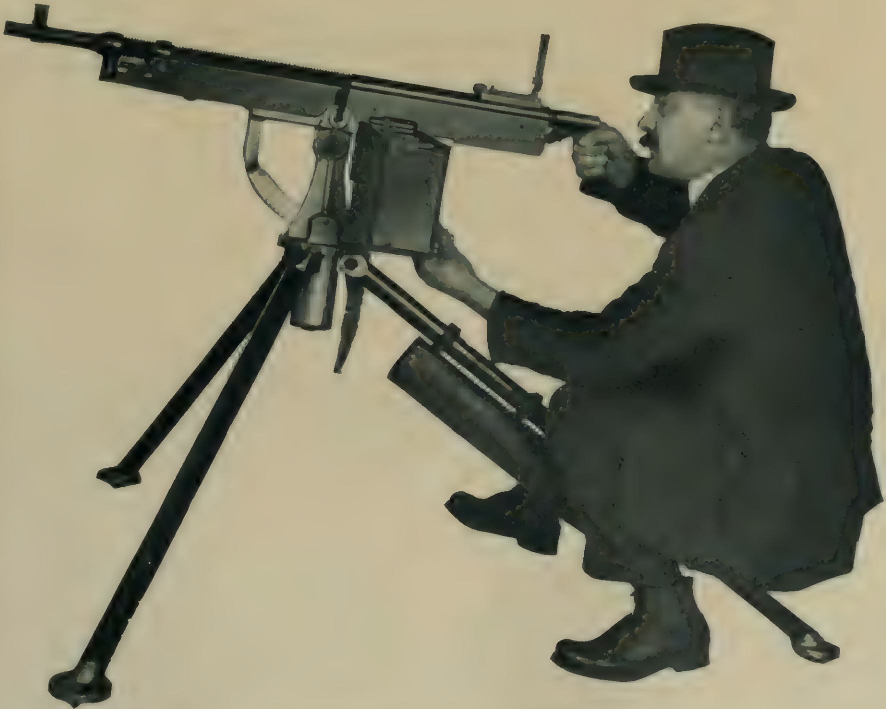
The Benet-Mercie or *automatic machine rifle* used in the army and navy of the United States is of this general type of gas-operative guns. The power that is used to operate the mechanism is obtained from a small portion of the powder gases that enter through a port in the barrel after the bullet has passed. After the first shot the rifle is self-operative until the ammunition in the feed strip is exhausted or until the trigger is released. The maximum rate of fire is about 400 shots per minute. The rapidity may be regulated to a certain extent by the regulator. The rate given is seldom maintained under service conditions in the hands of enlisted men, the best that may be expected being from 200 to 300 rounds per minute. The effective range is up to 1500 yards. The calibre is .30, the cartridge being the same as that used in the shoulder rifle. The gun is air-cooled, weighs 27 pounds alone, with new tripod about 50 pounds. In the field each gun with its ammunition and equipment requires three pack mules for transportation.

The guns of the (1*b*) type are quite numerous, but the Maxim automatic gun, the Maxim-Nordenfeldt automatic one-pounder, to which the name of pom-pom was given in the British-Boer War (1899–1902), the Dawson-Silverman (Vickers) automatic three-pounder, and the Skoda automatic gun are well known. In all except the Dawson-Silverman three-pounder the recoiling barrel or breech lock drives a train of mechanism and the pieces are loaded from a belt; in this three-pounder the ammunition is placed in a hopper over the breech, from which the cartridges fall into place by gravity when the breech is open and empty, and are driven forward into the breech by a loading lug. The Maxim-Nordenfeldt and Driggs are used in the United States navy. Both give satisfaction, but the Driggs mechanism, which is applicable to guns of the ordinary type, is the lightest and handiest. In guns of both makes the barrel, during recoil, compresses springs which cause it to move forward again, open the breech, extract the empty case, and leave the gun ready for loading. The new cartridge is forced in smartly by hand. This trips a double catch (on the extractor lugs) that holds the breech plug; the springs then force the plug into place, leaving the firing pin cocked and the gun ready for discharge again.

The Maxim system has been adopted in many armies and navies, and is on trial in several other countries. The Maxim automatic machine gun, calibre .30, modified and improved, in 1914 was under test in competition with the Benet-Mercie, and successfully met all the requirements of the army and navy of the United States. It is a water-cooled gun, weight alone 36½ pounds, with tripod 72 pounds. Late in 1914, after competition with many types of machine guns produced in Europe and in the United States, the American army adopted the new Vickers machine gun, which will therefore gradually displace the Benet-Mercie now used by that army. The retainer for the Vickers gun holds 250 cartridges as compared with 30 for the Benet-Mercie. During the test the Vickers

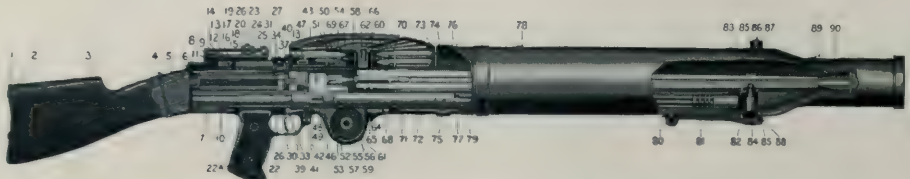


BENÉT-MERCIÉ AUTOMATIC MACHINE RIFLE
In firing position



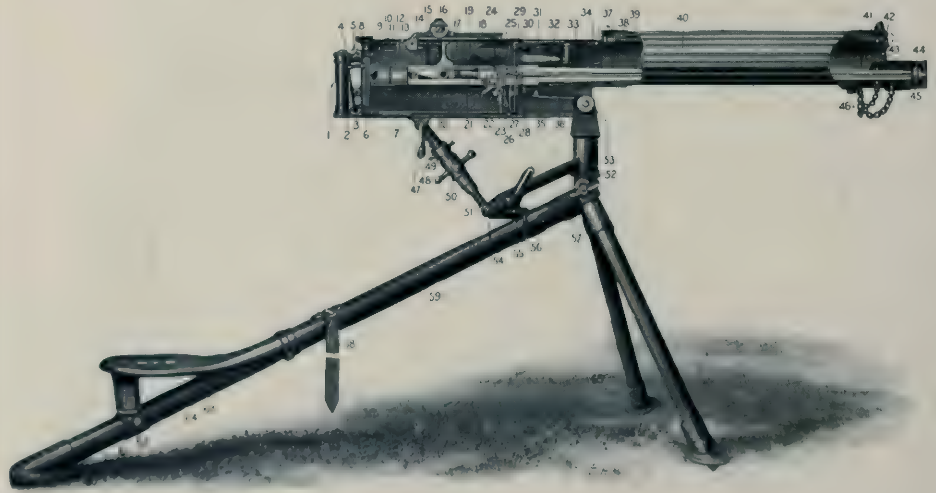
COLT AUTOMATIC GUN MOUNTED ON TRIPOD
Ready for firing and showing position of operator

AUTOMATIC MACHINE GUNS



LEWIS AUTOMATIC LIGHT MAGAZINE GUN

1, Butt plate; 2, butt plate screws; 3, butt; 4, butt tang screw; 5, butt tang; 6, feed cover latch; 7, butt latch, securing butt to receiver; 8, back sight bed spring; 9, back sight bed spring screw; 10, butt latch spring; 11, back sight bed; 12, feed cover latch pin; 13, feed cover; 14, back sight leaf; 15, back sight thumb piece; 16, back sight slide catch; 17, back sight fine adj. worm; 18, back sight fine adj. worm axis pin; 19, back sight slide catch spring; 20, back sight slide; 22, Firing hand grip; 22A, guard side rivets; 23, back sight axis pin washer; 24, back sight axis pin; 25, back sight axis washer fixing pin; 26, receiver; 27, magazine pawls spring; 30, trigger; 31, feed operating stud; 33, trigger pin; 34, feed operating arm; 37, bolt that closes breech and takes shock of discharge; 39, guard; 40, cartridge guide spring; 41, sear spring; 42, sear; 43, magazine pan; 46, gear stop; 47, striker fixing pin; 48, gear stop pin; 49, gear stop spring; 50, striker; 51, cartridge spacer; 52, gear operated by main spring; 53, main spring casing; 54 magazine top plate rivets; 55, main spring which closes breech and returns parts to firing position; 56, collet pin; 57, main spring collet; 58, magazine centre; 59, main spring rivets; 60, magazine latch spring; 61, gear casing; 62, magazine latch; 64, gear casing side piece; 65, gear case hinge pin; 66, feed operating arm latch; 67, magazine top plate; 68, receiver lock pin; 69, cartridge spacer rivets; 70, interior cartridge separators; 71, radiator casing rear, locking piece; 72, rack, actuated by piston and main spring; 73, Radiator casing rear, platform; 74, radiator casing rear; 75, piston connecting pin; 76, barrel; 77, gas cylinder; 78, radiator for cooling barrel; 79, piston operated by gases of exploding cartridge that ejects empty shell and resets firing pin; 80, regulator key stud; 81, gas regulator key; 82, gas chamber; 83, gas port; 84, gas regulator; 85, clamp ring; 86, fore sight; 87, clamp ring positioning screw; 88, clamp ring screw; 89, barrel mouth piece; 90, radiator casing front.



MAXIM AUTOMATIC MACHINE GUN WITH TRIPOD

1, Handle block; 2, firing trigger; 3, trigger pin; 4, trigger spring; 5, safety catch to prevent accidental discharge; 6, handle block pin; 7, trigger bar; 8, cover catch; 9, cover catch spring piston; 10, cover catch spring; 11, cover catch guide; 12, outside plate, left; 13, sight rack; 14, sight spring piston; 15, sight spring; 16, rear sight, complete; 17, upper guide block; 18 cover; 19, recoil plate, left; 20, crank; 21, crosshead; 22, tumbler; 23, hand sear; 24, firing pin; 25, lock frame; 26, main spring; 27, lock frame filler piece; 28, tail spring; 29, gib spring; 30, carrier; 31, feed box slide; 32, feed box; 33, barrel, 34, trunnion block; 35, bottom plate; 36, ejector tube spring; 37, rear plug; 38, inside slide; 39, outside slide; 40, water jacket for cooling barrel; 41, front sight, complete; 42, front plug; 43, water jacket cap; 44, nozzle; 45, barrel disk; 46, water plug for emptying; 47, upper elevating pin; 48, outer elevating screw; 49, check nut; 50, elevating nut; 51, inner elevating screw; 52, top carriage; 53, trunnion pin, 54, lower elevating pin; 55, traversing clamp; 56, traversing guide; 57, wing nut to control line of sight; 58, strap for binding tripod legs (when on the march); 59, outer trail tube; 60, trail shoe; 61, seat support; 62, seat bracket; 63, inner trail tube; 64, seat for operator; 65, front legs; 66, front shoes to support and prevent movement of tripod.

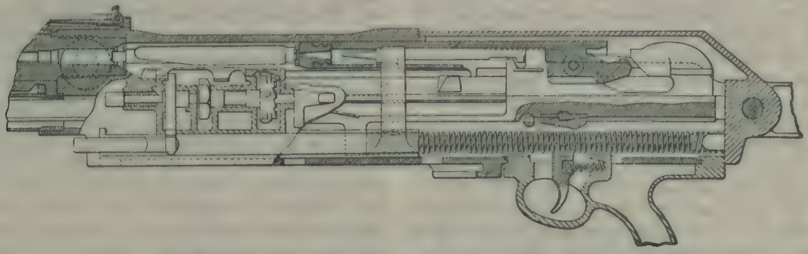
AUTOMATIC MACHINE GUNS

fired 6000 rounds without serious interruption. It is a water-cooled gun, weighing 36 pounds. It never becomes overheated, and is more easily assembled and disassembled than any other type. An infantry range finder is usually employed with this gun with great success, thus eliminating the necessity for ranging shots and enabling the gunner to smother a target at once even at ranges as great as 1500 yards. This gun uses the .30-calibre ammunition of the infantry rifle, and is fired from a substantial tripod.

Notwithstanding the improvements made in small guns, the conditions of battle are driving them out of use on board large vessels. Nothing less than a 3-inch shell will stop a torpedo boat, and even this calibre is believed to be too small, the effect of shrapnel from guns of 4-inch and above being so greatly superior to that of any kind of projectile from the smaller pieces. The speed with which heavy guns are now loaded has further decreased the importance of small guns on all ships. Although a few small-calibre rapid-fire and machine guns will probably be carried on future battleships, their use will be chiefly in auxiliary target work and landing operations.

In shallow-draft vessels and boats operating at close range in rivers and contracted waters machine guns of small calibre do great service. In several cases during the Philippine insurrection machine guns in boats and on the small gunboats drove off the enemy and prevented the loss of many men. The larger machine guns are so fitted that they may be fired singly at the will of the operator, and this is probably the best way to use them. Very rapid-firing machine guns of large calibre must have the weights and moments of the moving parts balanced about the axis of the bore; if not, the jump will prevent accurate shooting and compel a resort to single shot firing.

Unlike the field gun and heavy ordnance generally, the machine gun cannot be used against field works, fortifications, etc., and only in a limited sense and under rare circumstances against the defenders of such defenses. Since the Franco-German War of 1871 the French have constantly fostered the machine-gun arm of their services, both naval and military, although the practical results of the mitrailleuse in the campaign mentioned were not by any means what French military opinion had been led to expect. Machine guns were used by the English in their various Egyptian and Indian frontier expeditions with considerable advantage. In the British-Boer War of 1899–1902 every modern form of machine and automatic gun was employed, but the conditions were such that nothing very definite could be arrived at regarding their future method of employment. It was found, however, that although they had not the moral value with an enemy that the regular field gun and shell seemed to have, yet they exercised a moral influence peculiar to themselves. It frequently happened that the noise of the pom-pom (q.v.) in action had, if anything, a more demoralizing influence than the bursting of shrapnel shell. Machine guns were used by both Russia and Japan in Manchuria in 1904–05, and achieved an enormous importance, with the result that they are now considered indispensable for the armament of warships as well as in field and fortress warfare, and machine-gun detachments have been added to certain organizations of all modern armies. The organization of machine-gun detachments and their assignment to organizations have varied from time to time. In 1914 the organization in the German army was as follows: To each infantry regiment of 12 companies was attached a thirteenth company armed with 6 machine guns. The war strength was 1 captain, 3 lieutenants, 90 enlisted men, 40 horses, 12 vehicles (including the 6 machine guns). The limbers and 3 ammunition wagons carry 81,000 rounds of ammunition, or 13,500 per gun. To the cavalry were attached similar machine-gun organizations of 6 guns, with a war strength of 4 officers, 130 men, 90 horses, 14 vehicles (6 machine guns). Other nations are adopting similar systems. In the United States army the organization in 1914 was a provisional (war) machine-gun company of 2 officers, 4 guns, 50 men, 1 combat wagon, 4 mules (draft), 16 pack mules, attached to each regiment.


HOTCHKISS RIFLE-CALIBRE AUTOMATIC GUN, LONGITUDINAL SECTION.

In the Great War of 1914 it was proved that machine guns were effective up to 1500 yards and against large bodies of troops in close order up to 2000 yards. The service rate of fire was from 200 to 300 rounds per minute, which is equivalent to about 40 to 60 riflemen. They are capable of a sudden burst of fire, which, however, cannot be maintained for long periods on account of the difficulty of supplying ammunition. Their range being limited and usually inaccurately known, they cannot successfully replace the fire of field artillery. In defense a number of machine guns may be held in reserve for use as opportunity offers. In attack they are often most effective when located on the flanks. If the enemy has no field artillery the machine gun can be used with more boldness. If caught in the open with shrapnel fire machine guns cannot effectively protect themselves with their own fire. The *personnel* must seek cover, and subsequently change position.

Renewed interest in the development of a light-weight, handy, air-cooled machine rifle or gun has become evident since it has been found necessary to arm dirigibles and aëroplanes. Work along this line in 1914 was in an experimental stage. The Lewis (retired United States army officer) air-cooled machine rifle has met with considerable success. It was successfully fired at targets from aëroplanes in rapid motion, and was reported to have been used in the British aëronautical service.

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MACHINERY, Economic Effects of. The extension of machinery in modern production has given rise to a controversy as to its economic significance. The opposing attitudes may be said to spring from a difference in the point of view, those who defend machinery looking upon it chiefly from the standpoint of production, while the opposing party emphasizes its effects in distribution.

From the viewpoint of production the economic ideal is the maximum production of goods for the satisfaction of human wants. The machine enhances production by saving labor, but the real significance of labor saving is that with like quantities of human labor far greater results can be obtained by the use of machinery than without it. The emphasis which has been laid in the discussion upon labor saving rather than upon increased production has seemed to give a point of vantage to the opponent of machinery, who asks why mankind is benefited when labor, upon which the majority rely for their subsistence, is saved. It should, therefore, be understood that increased production is always involved in labor saving when the benefits of labor saving are discussed.

How machinery has multiplied the productive power of labor is a story that has been frequently told. For an exhaustive treatment of this aspect of the subject, the reader may be referred to the *Thirteenth Annual Report* (1898) of the United States Department of Labor on Hand and Machine Labor, in which no less than 672 examples of labor saving by the use of machinery are set forth. A study of this report will correct any misapprehension that this growth has been sudden. In many cases the data for hand and machine labor are almost contemporaneous, while in others the data for hand labor refer to very much earlier periods. An examination of the detailed tables will show that in the manufacture of like products, in some establishments, certain operations are performed by hand which are performed by machinery in others. It will show also just what operations in the aggregate process of bringing the goods to a completion have been affected by mechanical improvements and what remain for manual labor.

Countries bound by tradition and custom are slow to accept improvements, and even among the more advanced nations there is great inertia to be overcome. Nowhere has the utilization of perfected processes and mechanical appliances of all kinds been more rapid than in the United States. Elsewhere plants are only slowly reconstructed to meet the technical improvements, largely because of the considerable investment of capital in the older processes. But in the United States the spur of necessity has been greater because of the constant expansion of industry and the competition of new plants with old, which has forced the latter to keep up to the mark in their technical processes. A relative scarcity of labor as compared not alone with the industrial but also the agricultural possibilities of the United States has been a powerful spur to labor saving. In the period which gave its stamp to American economic development labor was the most costly element in the production of goods, and to the economizing of this element every effort was bent.

Thus far our attention has been directed to machinery and its application as a factor in the production of wealth. There is another side to the question, viz., its effects upon the laboring classes. The contention against machinery has been that it throws men out of employment, that it degrades labor and destroys all artistic elements of production. The introduction of labor-saving machinery almost inevitably throws men out of work, the machine taking their places. The persons thus displaced must, as a rule, seek employment elsewhere. It is possible that such an impetus will be given to the industry that there will be room for the employment of all who were previously at work, but this is not probable in the first instance. It is not likely that there will be an immediate expansion of the demand for the product commensurate with the increased facilities of production, without reducing the labor force. In the long run the industry will generally develop so as to afford even wider opportunities for employment than before. But the process takes time, and meanwhile the laborer must either starve or find employment elsewhere. Moreover, it is by no means certain that when the enhanced demand for labor occurs in the employment from which machinery had driven the workman, the same kind of labor as that which has been displaced will be needed. The skill which the laborer has acquired in his calling may no longer be in demand, and he may have to apply himself to something else for which he is less fitted and in which he can render service of an inferior grade only. That these changes in industry involve great hardships for individuals cannot be denied. It is vain to point out that the demand for labor in general is probably not diminished, that industries increase, and that new industries are created by inventions and machinery. It was of little consequence to the weaver who was thrown out of employment by the power loom that the workshops in which the machinery was manufactured had an increased demand for machinists. Little as we can doubt that an industrial community eventually adjusts itself to such changes, just as little can we doubt that they press hard upon the individuals who are immediately affected by them.

The most that can be said in answer to the foregoing argument is that there are mitigating circumstances which have been overlooked. In the first place, industrial changes are not abrupt; they are evolutionary rather than revolutionary. They do not affect large bodies of workmen at once. Invention proceeds by slow movements, and the introduction of improved processes is not simultaneous throughout an industry. Furthermore, the division of labor which prevails when machinery is employed reduces processes to comparatively simple elements and creates analogous processes in branches of production which are apparently widely dissimilar. This facilitates in a high degree the passage from one employment to another. All of these things do not remove the evils for the individual of industrial changes, but they mitigate their severity.

Much more serious is the charge that machinery degrades the laborer and makes him a mere part of the mechanism. It is charged that the monotony of the operations deadens the intellect, while the stress and strain of the labor which must keep pace with the machinery impair the body and weaken vitality. The early history of manufacturing in England seemed to bear out these assertions, and the well-authenticated pictures of the misery and suffering in the manufacturing districts lend a sombre color to the history of the first half of the nineteenth century. But factory legislation has done much to remove the evils complained of, and there is no convincing evidence of permanent deterioration.

Akin to this objection to machinery is the claim that in doing away with the old handicrafts art in industry was abolished. The old artisan was the master of a series of operations which culminated in the finished product. The modern workman knows but a part of the work and the old skill has passed away. The artisan, it is said, has been degraded into a mere laborer. But the assertion is too general. While operations changed there was still room for the better craftsman. He rose to the work of superintendence, becoming the foreman or overseer of the new system. The poorer craftsmen undoubtedly sank to the position of workmen, but to lose a poor carpenter and obtain a good hand in a planing mill is probably no loss to the community at large. Moreover, as the gap between skilled and unskilled labor was no longer as wide as of old, there has probably been an uplifting of the general character of labor performed. As to the artistic side of production, it may have seemed at one time that machinery was eliminating this factor, but in view of recent developments this cannot be stated as a present tendency. With the perfection of machinery and the widespread use of manufactured products the artistic element has reasserted itself, and it is probable that artistic forms are more widely diffused in common life than they ever were before. Finally, it is to be borne in mind that the lowering in prices which results from the introduction of machinery frequently means an increase in the real wages of the laborers not immediately affected by the change. The simultaneous introduction of machinery in all of the principal industries might conceivably lower wages, estimated in money, while leaving unchanged the quantity of commodities which the laborer can command. What is of supreme importance, however, is the fact that the increased productivity of industry creates a fund of wealth out of which higher wages for shorter hours may eventually be obtained. It undoubtedly will be through inventions that the laboring class will eventually find relief.

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MACHINE TOOLS. See METAL-WORKING MACHINERY.

MACHINIST, NAVAL. A warrant officer in the United States navy. His duties are connected with boilers and machinery of vessels. He is required to be a capable mechanic in all matters pertaining to machine work and to understand thoroughly how to effect all ordinary repairs to boilers, engines, and other machinery and how to care for and operate them. After six years' service as such, a machinist is eligible for a commission as a *chief machinist*, with the rank of ensign. Any machinist or chief machinist who is less than 35 years of age and who is recommended for such promotion will, if he can pass the necessary examination, be commissioned as an ensign and placed in the regular list of line officers. In 1914 there were, on the active list of the navy, 126 chief machinists and 116 machinists. The pay of a chief machinist is the same as that of an ensign; of a machinist, the same as that of other warrant officers. See BOATSWAIN; GUNNER; ETC.

MACHO, mä'shȯ (Sp., male), **MACHUTO,** mȧ-cho͞o'tȯ. A West Indian name of the common mullet (*Mugil cephalus*). See MULLET.

MACHPELAH, măk-pē'lȧ, CAVE OF. A cave at Hebron, the traditional burial place of the patriarchs. On its site stands a magnificent mosque, access to which is strictly denied to Christians.

MACHRAY, mȧ-krā', ROBERT (1831–1904). A Canadian Anglican archbishop. He was born in Aberdeen, Scotland, was educated at Sidney Sussex College, Cambridge University, and was ordained a priest in 1856. He was vicar of Madingley, England, until 1865, when he was appointed Bishop of Rupert's Land. On the union of the Anglican churches in Canada in 1893 he became Archbishop of Rupert's Land and Primate of All Canada. He was appointed professor of ecclesiastical history and liturgiology in St. John's College (Anglican), Winnipeg, and for some time was chancellor of Manitoba University. He was four times a delegate to the Lambeth Conference, London, and in 1890 presided over the conference organized to promote the union and consolidation of Anglican churches in British North America. He published *A Manual of Family Prayers* (1895).

MACHUELO, mȧ-chwā'lȯ (Sp., dim. of *macho*, male). The West Indian name of the thread herring (q.v.). A closely related species (*Opisthonema libertate*) is known in Central America as Sardinia machete.

MACIEJOWICE, mȧ'chȧ-yȯ-vĭt'sĕ. A village of Russian Poland, in the Government of Siedlce, near the right bank of the Vistula. It is noted for the battle fought there on Oct. 10, 1794, in which the Polish patriots under Kosciuszko succumbed to the Russians, commanded by Suvorov and Fersen, and Kosciuszko was taken prisoner.

McILVAINE, măk′ĭl-vān′, Charles Pettit (1799–1873). An American Protestant Episcopal bishop. He was born in Burlington, N. J., graduated at Princeton in 1816, was ordained minister in 1821, and had charge of Christ Church, Georgetown, D. C., for five years. From 1825 to 1827 he was chaplain and professor of ethics and history in the Military Academy at West Point. From 1827 to 1832 he was rector of St. Ann's Church, Brooklyn, N. Y., and in 1831 was chosen professor of ethics and revealed religion in the University of the City of New York. He was consecrated Bishop of Ohio in 1832 and also held the presidency of Kenyon College at Gambier from 1832 to 1840 and afterward the presidency of the theological seminary there. During the Civil War he was a member of the United States Sanitary Commission and, visiting Europe, publicly defended the national cause. Among his published writings are: *Lectures on the Evidences of Christianity* (1832); *The Holy Catholic Church* (1844); *The Truth and the Life* (1855).

McILWRAITH, măk″l-rāth, Jean Newton (1871–). A Canadian author. She was born in Hamilton, Ontario, and was educated at the Hamilton Ladies' College. She began to write for the magazines in 1890, and her contributions afterward appeared in *Harper's Bazar, Harper's Magazine, Cornhill, The Atlantic Monthly*, and other periodicals. Later she removed to New York City and engaged in editorial work for a publishing house. She wrote: *The Making of Mary* (1895); *The Span of Life* (1898), with W. McLennan; *A Book about Shakespeare* (1898); *Canada* (1899), in "Children's Study Series"; *A Book about Longfellow* (1900); *The Curious Career of Roderick Campbell* (1901); *The Life of Sir Frederick Haldimand* (1903), in "The Makers of Canada Series"; *A Diana of Quebec* (1912).

McILWRAITH, Thomas (1824–1903). A Canadian ornithologist. He was born in Ayrshire, Scotland, was educated there, removed to Edinburgh in 1848, and in 1853 removed to Hamilton, Ontario. While engaged in business in that city, he spent his leisure in studying birds, making observations at first in the vicinity of Hamilton, and gradually increasing them until the results were published in the *Canada Journal* in 1861. At the request of American ornithologists he prepared in 1865 a more extended list; and in 1883 he took part in a conference of American ornithologists held in New York for the purpose of revising the classification and nomenclature of American birds. The conference resulted in the American Ornithologists' Union. McIlwraith was appointed the superintendent of Ontario for the migration committee and organized the work of the union in that province. He published *The Birds of Ontario* (1887; 2d ed., 1894).

McINTOSH, măk′ĭn-tŏsh, Lachlan (1725–1806). An American soldier. He was born near Raits, Badenoch, Scotland, and was a son of John More McIntosh, who went to Georgia in 1736. Lachlan entered the mercantile house of Henry Laurens at Charleston, but was afterward a land surveyor. At the beginning of the Revolutionary War he was colonel of the First Georgia Battalion and in 1776 was made a brigadier general. In 1777 he killed ex-Governor Button Gwinnett in a duel. He was selected by Washington to lead an expedition against the Western Indians in 1778, took part in the siege of Savannah the next year, and was taken prisoner at the capture of Charleston in 1780.

McINTOSH, William Carmichael (1838–). A Scottish zoölogist, born at St. Andrews and educated there at Madras College and the University and at Edinburgh. He practiced medicine, but early devoted himself to marine zoölogy, becoming professor of natural history at St. Andrews and director of the University Museum and of the Gatty Marine Laboratory. In 1884 he was appointed scientific reporter to the Royal Commission on Trawling. Afterward he served on the Commission on Irish Inland Fisheries and on the Fishery Board of Scotland. He was gold medalist of the Edinburgh Fisheries Exhibit of 1882 and of the London Exhibition of 1883 and royal medalist of the Royal Society in 1899. Among his publications, many illustrated by his own drawings, are: *Observations and Experiments on the Shore Crab* (1861); the exhaustive *Monograph of British Annelids* (1874–1910); *The Marine Invertebrates and Fishes of St. Andrews* (1875); *Food Fishes of Britain* (1897), with Masterman; *The Resources of the Sea* (1899).

MACIP, mȧ-thēp′, Vicente Juan (c.1523–79), often called Juan de Juanes. A Spanish painter, the first important master of the school of Valencia. He was born in the Valencian hills and was probably the pupil of his father, Juan Vicente Macip, a follower of Fra Bartolommeo. His art unites in a remarkable manner the minute finish of the Netherlanders with the forms of the Italian Renaissance. The resemblance of his paintings, especially the Holy Families, to Raphael's has led to the assumption that he studied under the latter's followers at Rome. He is called by his countrymen the Spanish Raphael. Nevertheless, his pictures contain elements of individuality, his types of Christ and the Virgin being essentially Spanish in their expression of tenderness and of ardent mysticism, typical of his own sincere piety. Macip settled at Valencia, where he founded an important school, but was also employed in other cities of Spain. Among his chief religious paintings are: "The Baptism of Christ," "Conversion of Paul," and "A Holy Family," in the cathedral of Valencia; "A Last Supper," in the church of St. Nicholas, Valencia; and six pictures from the "Life of St. Stephen," in the Prado Museum. He also painted some excellent portraits in a style resembling that of Bronzino, the best known of which are those of Luis de Castelvi, in the Prado, Archbishop Tomás de Villanueva and Juan de Ribera, in the cathedral of Valencia.

MacIVOR, măk-ē′vẽr, Flora. The heroine of Scott's *Waverley*.

MACK, măk, Karl, Baron Mack von Leiberich (1752–1828). An Austrian general. He was born at Nennslingen in Franconia and in 1770 entered the Austrian military service. He fought bravely against the Turks and by 1797 had attained the rank of field marshal. In the winter of that year he assumed the command of the Neapolitan troops against the French, but met with small success and was forced by a popular uprising to give himself up to the enemy. In 1805, on the outbreak of war between Austria and the French Emperor, he pressed into southern Germany at the head of an army of 80,000 men, but was decisively beaten on the river Iller (October 14–15) and threw himself into a trap at Ulm (q.v.), where he was forced to surrender on the 17th with 23,000 men. Returning to Austria, he suffered the loss of his rank and was imprisoned for two years.

MACK, Norman Edward (1858–). An American Democratic politician and newspaper publisher. He established the Buffalo (N. Y.) *Sunday Times* in 1879 and the *Daily Times* in 1883, both of which he continued to publish. Becoming active in Democratic politics, he came to be regarded by many as the up-State representative of Tammany Hall; yet in this connection it should be remembered that he was selected by Bryan in 1908 to be chairman of the Democratic National Committee. Mack was frequently before the public as the bitter rival of the faction headed by "Fingy" Connors, of Buffalo. With respect to his political affiliations he was not without enthusiastic defenders. He served as a delegate to each of the Democratic national conventions from 1892 to 1908, and after 1900 was a member of the Democratic National Committee. After the election of Wilson, he was prominently mentioned for a high diplomatic post. In 1915 he was chairman of the New York State Committee for the Panama-Pacific Exposition at San Francisco.

MACKAIL, John William (1859–). An English man of letters, devoted especially to the study of the classics. He was for a time a fellow of Balliol College, Oxford, and in this university served as professor of poetry from 1906 to 1911. His writings include: *Select Epigrams from the Greek Anthology* (1890; 3d ed., rev., 1912); *Biblia Innocentium*, i–ii (1893, 1901); *Latin Literature* (1895); *Life of William Morris* (1899); a translation into English prose of Vergil's *Eclogues and Georgics*, and of the *Æneid* (1908); *The Springs of Helicon*, a discussion of the evolution of English poetry as seen in Chaucer, Shakespeare, and Milton (1909); *Lectures on Greek Poetry* (1910); *Lectures on Poetry*, essays dealing with Vergil, Arabian epic, lyric, and romantic poetry, Shakespeare, Keats, etc. (1911); *Commemorative Address on Arthur Woollgar Verrall* (1913).

McKAY, ma-kī′, Alexander Charles (1861–). A Canadian educator. He was born at Guysboro, Nova Scotia, and was educated at Toronto and Cambridge universities. After teaching for several years he was, in 1890, appointed professor of mathematics and physics in McMaster University, Toronto, becoming later dean of the faculty of arts. In addition he delivered lectures in physics and mathematics respectively in Toronto University and the Ontario School of Pedagogy (1890–92). He was chancellor of McMaster University (1905–11) and in 1911 was appointed principal of the New Technical School, Toronto. In 1905 he became a member of the Ontario Educational Council.

MACKAY, Alexander Murdoch (1849–90). A Scottish missionary, born at Rhynie, Aberdeenshire. He studied at the Free Church Training College for Teachers in Edinburgh in 1867–69 and also spent three years at the university of that city. In 1873–76 he studied and also worked as a draftsman with engineering firms in Berlin. In response to Stanley's call for missionaries to Uganda he set out with four others in April, 1876, and in November, 1878, he reached Uganda, though several of his company had been killed. In Uganda he continued his missionary labors until his death, having won the friendship of King Mtesa, and gained considerable influence among the natives. Consult *A. M. Mackay, Pioneer Missionary of the Church Missionary Society to Uganda*, by his sister, Alexina Mackay (New York, 1901).

MACKAY, mak-ī′, Charles (1814–89). A British poet and journalist, born in Perth, Scotland, March 27, 1814. He was educated at the Caledonian Asylum, London, and at a school in Brussels. After serving as secretary to William Cockerill, near Liége, he returned to London (1832). Mackay served as assistant editor of the London *Morning Chronicle* (1835–44), editor of the Glasgow *Argus* (1844–47), editor of the *Illustrated London News* (1852–58); started the *London Review* (1860) and *Robin Goodfellow* (1861), neither of which was successful; and was a New York correspondent for the London *Times* during the Civil War (1862–65). He died in London, Dec. 24, 1889. Widely known for his songs, among which are "Cheer, Boys! Cheer!" and "There's a Land, a Dear Land," from his pen appeared, in all, 14 volumes of verse, beginning with *Songs and Poems* (1834) and closing with the posthumous *Gossamer and Snowdrift* (1890). He also published two novels, *Longbeard* (1841) and *Luck, and What Came of It* (1881); much miscellaneous prose, as *Memoirs of Extraordinary Popular Delusions* (1841), *The Gaelic and Celtic Etymology of the Languages of Western Europe* (1877), *A Dictionary of Lowland Scotch* (1888); and literary reminiscences, under the titles *Forty Years' Recollections* (1878) and *Through the Long Day* (1887).

MACKAY, Clarence Hungerford (1874–). An American capitalist, son of John W. Mackay, whom he succeeded as president of the Commercial Cable Company. He became president also of the Commercial Cable Building Company, Commercial Cable Company of Cuba, Commercial Pacific Cable Company, Pacific Postal-Telegraph Cable Company, Postal-Telegraph Cable Company, Postal Telegraph Building Company, and The Mackay Companies. He served also as trustee of the Greenwood Cemetery Company, as a founder and vice president of the New Theatre, New York, as a director of the Metropolitan Opera, and as treasurer of the Lincoln Farm Association.

McKAY, Donald (1810–80). An American shipbuilder. He was born in Nova Scotia, learned the trade of shipbuilder in New York, and went into the business in Newburyport, Mass. In 1845 he established at East Boston a shipyard that became famous for the improvements introduced in the models of large clipper trading ships. In 1853 he built the *Great Republic* of 4500 tons' burden, which for a time was the largest ship in the world.

MACKAY, Eric (1851–98). An English poet, a son of Charles Mackay, born in London. He was educated in Scotland and subsequently passed several years in Italy. As a poet, he was distinguished for his artistic handling of lyrical rhythms, notably in *Love-Letters of a Violinist* (1886) and *A Lover's Litanies* (1888). He also made a very fine dramatic study in *Vero and Actæa* (1891). Among his other volumes of verse are: *Gladys the Singer* (1887); *My Lady of Dreams* (1895); *Arrows of Song* (3d ed., 1896); *The Lover's Missal* (1898).

MACKAY, John William (1831–1902). An American capitalist, born in Dublin, Ireland. He came to New York City when he was a boy and learned the shipbuilder's trade. In 1851 he went to California and in 1852 to Nevada, where he obtained a two-fifths share in the Bonanza mines of the Comstock Lode. He was disappointed again and again, but, as he was about to give up working the lode, a rich vein which produced more than a hundred millions was disclosed. With Flood, Fair, and O'Brien, his partners in this mine, he formed the Nevada Bank and was long its president, but withdrew his capital after Flood's disastrous attempt to corner wheat. In 1884, largely because of enmity to Jay Gould, he formed with James Gordon Bennett the Commercial Cable Company and the Postal Telegraph Company to fight the Western Union; laid the cable in spite of many difficulties, and fought a long fight with the old cable lines, which cut the rate to 12 cents a word in a vain attempt to force Mackay out.

MACKAYE, mak-ī′, Percy (1875–). An American dramatist and poet, son of (James) Steele Mackaye. He was born in New York. After graduating from Harvard in 1897, he studied at the University of Leipzig and traveled abroad from 1898 to 1900, returning to New York to teach in a private school. After 1904 he was engaged almost entirely in dramatic work. Harvard, Yale, Columbia, and other universities have invited him from time to time to lecture on the theatre or the drama. He became a member of the National Institute of Arts and Letters, and Dartmouth gave him an honorary M.A. in 1914. Percy Mackaye has an honorable place among the American dramatists of his day. Impressive in his serious and tragic dramas, his comedies are characterized by true humor and by satiric point and force; and his dramatic work as a whole, more than that of any contemporaneous American dramatist, is animated by the spirit of poetry. He became much interested in a movement to establish rural theatres. His publications, dramatic and other, include: *The Canterbury Pilgrims: A Comedy* (1903), performed in the open air at several universities and, in 1909, as a pageant in honor of President Taft, at Gloucester, Mass.; *A Modern Rendering into Prose of Chaucer's Tales* (1904); *Fenris the Wolf: A Tragedy* (1905); *Jeanne d'Arc: A Tragedy* (1906); *Sappho and Phaon* (1907); *The Scarecrow: A Tragedy of the Ludicrous* (1908); *Mater: An American Comedy* (1908); *The Playhouse and the Play* (1909), essays; *Poems* (1909); *A Garland to Sylvia: A Comedy* (1910); *Anti-Matrimony* (1910), a satirical comedy; *Thoroughbred* (1911); *Steele Mackaye: A Memoir* (1911); *Yankee Fantasies* (1911), one-act plays; *The Civic Theatre* (1912); *The Modern Reader's Chaucer* (1912), with J. S. P. Tatlock; *Saint Louis: A Civic Masque* (1914); *Sanctuary: A Bird Masque* (1913); *A Thousand Years Ago: A Romance of the Orient* (1914); *The Present Hour* (1914), poems. With Professor Tatlock he edited *The Complete Poetical Works of Geoffrey Chaucer* (1914).

MACKAYE, (James) Steele (1842–94). An American dramatist, born in Buffalo. He studied dramatic expression in Paris under François Delsarte and on his return to America lectured in New York City and Boston. His two plays, *Monaldi* and *Marriage*, written about this time, were produced at the St. James Theatre in New York City. He afterward toured in England as an actor and played Hamlet in London, where he collaborated in several well-known plays. His other works include: *The Twins* (1876); *Won at Last* (1877); *Through the Dark* (1878), later called *Money Mad; Hazel Kirke* (1880); *Anarchy* (1887), later called *Paul Kauvar*. Consult Percy Mackaye, *Steele Mackaye: A Memoir* (New York, 1911).

McKEAN′, Thomas (1734–1817). An American patriot and politician, signer of the Declaration of Independence. He was born at New London, Chester Co., Pa., of Irish parentage, and was educated privately at New Castle, Del., where he settled. He was admitted to the Delaware bar in 1754, was immediately appointed register of probate, and in 1756 became assistant attorney for Sussex County. From 1757 to 1759 he was clerk of the Delaware Assembly and in 1762 was commissioned with Cæsar Rodney (q.v.) to revise all the laws of Delaware passed prior to 1752. In the same year he began his long service as a member of the Delaware Assembly, where he served continuously by reëlection until 1779. In 1765 he was elected to the Stamp Act Congress (see Stamp Act), where he was instrumental in securing an equal vote for each of the provinces represented and assisted in drawing up the memorial to Parliament. He was elected in the same year a judge of the Common Pleas and boldly ruled that only unstamped paper should be used in his court. In 1771 he was collector of the port of New Castle and about the same time opened an office for the practice of law in Philadelphia. He continued to reside for part of the time in Delaware, however, and in 1774 was elected a delegate from that province to the Continental Congress. In the proceedings of that body he took a leading part, serving from 1774 to 1776 and from 1778 to 1783. He favored the adoption of the Declaration of Independence, and, though absent when that document was signed, he was later (probably in 1784) allowed to affix his signature. He also helped to draft the Articles of Confederation, which he signed. While still a member of the Delaware Assembly, and one of the Delaware delegates in Congress, he became prominently identified with Pennsylvania affairs; he was chairman of the Committee of Safety in that State in 1776 and in 1777 was chosen Chief Justice, a position which he held until 1799. In the latter year, having become one of the leaders of the Republican party and a strong supporter of Jefferson, he was elected Governor of Pennsylvania, which office he filled until 1808. With James Wilson he was the author of *Commentaries on the Constitution of the United States* (1790).

McKEESPORT, ma-kēz′pōrt. A city in Allegheny Co., Pa., 15 miles by rail southeast of Pittsburgh, at the confluence of the Monongahela and Youghiogheny rivers, and on the Pennsylvania, the Baltimore and Ohio, and the Pittsburgh and Lake Erie railroads (Map: Pennsylvania, B 6). It is in the heart of the natural gas and the bituminous coal regions of the State and is the seat of a vast iron and steel industry, the plant of the National Tube Works, which alone employs 10,000 men, being one of the largest in the world. Other manufactures are sheet and tin plate, projectiles, tool steel, brick, candy, glass, and railroad torpedoes. There is a large trade in coal and lumber. The city has a United States government building, McKeesport Hospital, Carnegie library, Young Men's Christian Association Hall, a fine high-school building (cost $168,000), Duffs College, St. Barnabas Home, Douglass Business College, McKeesport Swimming Pool and Playgrounds, and several bridges. McKeesport adopted the commission form of government in 1913, the power being vested in a mayor and four commissioners. The city's income in 1912–13 was $928,000, while its payments amounted to $964,000, the principal items of expense being $224,000 for education, $43,000 for the fire department, $51,000 for the police department, and $98,000 for the water works, which are owned and operated by the city, having been built in 1882 at a cost of about $425,000. Settled in 1795 and named in honor of John McKee, its founder, McKeesport was incorporated as a borough in 1842 and as a city in 1891. Until 1830, when coal mining began in the district, it was a straggling village. Pop., 1900, 34,227; 1910, 42,694; 1914 (U. S. est.), 45,965; 1920, 45,975.

McKEES ROCKS. A borough in Allegheny Co., Pa., on the Ohio River, opposite Allegheny, adjoining Pittsburgh, and on the Pittsburgh and Lake Erie and the Pittsburgh, Chartiers, and Youghiogheny railroads (Map: Pennsylvania, A 6). It is known for its extensive iron and steel interests, and there are also large railroad machine shops, and manufactories of enamel ware, lumber, wall plaster, locomotive and car springs, nuts and bolts, malleable castings, chains and forgings, freight and passenger cars, tin and enamel ware, concrete, cigars, etc. The Ohio Valley General Hospital is situated here. Pop., 1900, 6352; 1910, 14,702; 1914, 18,258; 1920, 16,713. The borough derives its name partly from Alexander McKee, to whom a 1300-acre tract of land was given in 1764, and from a rocky projection into the river at this place.

McKEE′VER, William Arch (1868–). An American educator, born in Jackson Co., Kans. He was educated at the University of Kansas (A.M., 1898), at Chicago (Ph.M., 1904), and at Harvard. From 1900 to 1913 he was professor of philosophy at the Kansas State Agricultural College, and thereafter he served as professor of child welfare at the University of Kansas. In 1909 he originated the "Home Training Bulletins," which became widely known, and he was one of the organizers of the playground movement in the United States. He is author of *Psychology and Higher Life* (1898; rev. ed., 1908); *Psychologic Method in Teaching* (1909); *The Pioneer: A Story of the Making of Kansas* (1911); *Farm Boys and Girls* (1912); *Training the Boy* (1913); *Training the Girl* (1914); *Industrial Training of the Boy* (1914); *Industrial Training of the Girl* (1914).

MacKEL′LAR, Thomas (1812–99). An American type founder and poet, born in New York City. He learned the trade of printing in the Harpers' publishing house and then entered the firm of Lawrence Johnson & Co., Philadelphia, as a proof reader. He rose to be a partner and the head of the establishment, later known as the MacKellar, Smith & Jordan Co. His works include *The American Printer: A Manual of Typography* (1866; 15th rev. ed., 1878); and, in different fields, *Droppings from the Heart* (1844); *Tam's Fortnight Ramble* (1847); *Lives for the Gentle and Loving* (1853); *Rhymes Atween Times* (1873). The firm of which he was the head has published a *New and Original Series of Old Style Types.*

McKELWAY, ma-kĕl′wā, St. Clair (1845–1915). An American newspaper editor, born at Columbia, Mo. He was admitted to the New York bar in 1866, became a newspaper writer, and in 1868 he joined the staff of the Brooklyn *Eagle*, of which he was associate editor in 1883–85 and editor in chief after 1885. Under his direction the *Eagle* became one of the well-known papers of the United States. In 1883 he became a regent of the University of the State of New York, in 1900 vice chancellor (acting chancellor, 1905–12), and chancellor in 1913. He was chosen to membership in the National Institute of Arts and Letters.

McKEN′DREE, William (1757–1835). A Methodist Episcopal bishop. He was born in King William Co., Va., July 6, 1757; served in the Revolutionary War; was converted and joined the Methodist church in 1787; became presiding elder in 1796, and Bishop, the first one born in America, in 1808. He died near Nashville, Tenn., March 5, 1835. By reason of his travels with Bishop Asbury and as superintendent of the societies in Virginia, Kentucky, Tennessee, Ohio, and Illinois, and as Bishop, he was well known to Methodists, especially in those States. His *Life* by Paine (Nashville, 1869; new ed., 1875) is consequently an important source of early Methodist history.

McKENDREE COLLEGE. An institution for higher education, founded at Lebanon, Ill., under the auspices of the Methodist Episcopal church. It was organized in 1828 as Lebanon Seminary and was one of the earliest institutions in the West dedicated to higher education. In 1830 the name was changed in honor of Bishop McKendree, who bequeathed his estate to the college, and in 1839, with the coöperation of Abraham Lincoln, a new charter was secured which granted to the institution full university privileges. In the college proper are two courses, classical and scientific, as well as graduate and law departments and a conservatory of music. The bachelor's degree is conferred in arts, science, law, and music, and the master's and doctor's degrees for graduate work. There were in all departments of the college, in 1914–15, 365 students and 16 instructors. The library contained about 10,000 volumes. The president in 1915 was John F. Harmon, D.D.

McKENDRICK, ma-kĕn′drĭk, John Gray (1841–). A Scottish physiologist. He was born in Aberdeen, was educated there and at Glasgow, and from 1876 to 1906 was professor of physiology in the University of Glasgow. He was Fullerian professor of physiology at the Royal Institution of Great Britain and president of the physiological section of the British Association. His most important researches were on the physiology of the nervous system and of the senses, and he made particularly valuable analyses of vocal records on the phonograph. His major published works include: *Animal Physiology* (1876); *History of Physiology* (1879); *Text Book of Physiology* (1888); *Life in Motion, or Muscle Nerve* (1892); *Physiology* (1896); *The Boyle Lecture on Hearing* (1899); *Life of Helmholtz* (1899); *Science and Faith* (1899); *Christianity and the Sick* (1901).

MACKEN′NA, Benjamin Vicuña-. A Chilean historian. See Vicuña-Mackenna, Benjamin.

McKENNA, James Andrew Joseph (1862–). A Canadian political negotiator. He was born in Charlottetown, Prince Edward Island, and was educated at St. Dunstan's College there. In 1886 he entered the Indian Department of the Dominion Civil Service. He was one of two commissioners who brought about a settlement with British Columbia for the administration of the railway belt lands (1897); a royal commissioner to conclude a treaty whereby the Indians surrendered the Peace River and Athabasca country to the crown (1899); chairman of the royal commission for settling the claims of the half-breeds of the Canadian northwest (1901); and also secured by treaty the relinquishment of Indian claims to the country about Buffalo Lake, Churchill River, and Reindeer Lake. In 1909 he was made inspector of Indian Catholic schools for the Canadian Northwest Provinces and Territories. He published *Sir John Thompson: A Study* (1895) and *The Hudson Bay Route* (1907).

McKENNA, Joseph (1843–). An American jurist and statesman, born in Philadelphia. He was educated at St. Joseph's College, Philadelphia, and, his family having removed to the Pacific coast, at the Benicia (Cal.) Collegiate Institute. In the same year that he was admitted to the California bar (1865), he was elected district attorney of Solano County, serving until 1868. In 1875–76 he was a member of the State House of Representatives, where he won popularity by a speech on railroad regulation, and from 1885 to 1892 he was in Congress. Here, as a member of the Ways and Means Committee, he was closely associated with William McKinley, and a cordial friendship developed between them. He took an active part in the tariff legislation of the time. He resigned to accept an appointment as United States circuit judge for the Pacific coast or ninth circuit. In 1897 he was appointed Attorney-General in the cabinet of President McKinley. As such, he rendered an important opinion on section 22 of the Dingley Tariff Bill and took part in the settlement of the Union Pacific Railroad controversy. In 1898 he succeeded Justice Field on the Supreme Court bench. Justice McKenna was usually considered one of the conservative members of the court, and his opinions showed a profound respect for the Constitution.

McKENNA, Reginald (1863–). An English statesman, born in London. He was educated at King's College, London, and at Trinity Hall, Cambridge, where he was scholar, took honors in mathematics, and was bow in the varsity eight in 1887. Becoming a barrister in the latter year, McKenna practiced until 1895. In 1892 he unsuccessfully contested Clapham in the Liberal interest, but after 1895 he was a member of Parliament for North Monmouthshire. He became Financial Secretary of the Treasury in 1905. In 1907 he was appointed a member of Campbell-Bannerman's cabinet as President of the Board of Education, and he introduced the unsuccessful "contracting-out" bill of 1908. From the latter year until October, 1911, he was First Lord of the Admiralty and in 1911–15 Home Secretary. He was prominent in the movement for Welsh disestablishment, introducing the bill of 1912. In the great strikes of 1912 he failed, his opponents claimed, to furnish strike breakers with adequate police protection, and he shortened the sentences of many strike leaders. His treatment of militant suffragettes under the "Cat-and-Mouse Act" also was criticized sharply both by Conservatives and by feminists. In May, 1915, McKenna succeeded Lloyd George as Chancellor of the Exchequer, in Asquith's new coalition cabinet.

MACKENNAL, *ma-kĕn′al*, Alexander (1835–1904). An English Congregational minister, born at Truro in Cornwall. He studied at Glasgow University and at Hackney College and graduated B.A. from London University in 1857. He held pastorates at Burton-on-Trent (1858–61), Surbiton (1862–70), Leicester (1870–76), and Bowden, Cheshire (1877–1904). In 1887 he was chairman of the Congregational Union of England and Wales. He made the first of several visits to the United States in 1889, and this led to the first International Congregational Council at London in 1891, of which he was the prime organizer. He published: *Christ's Healing Touch and Other Sermons* (1871); *Life of John Allison Macfadyen* (1891); *Homes and Haunts of the Pilgrim Fathers* (1899); *The Eternal Son of God and the Human Sonship* (1903).

MacKEN′TY, John Edmund (1869–). An American laryngologist. Born at Richmond, Province of Quebec, Canada, he was educated at Ottawa University and at McGill, where he graduated M.D. in 1894. After further study in Europe he established himself in New York City, where he became professor of otology in the New York Polyclinic. He contributed to medical journals articles on the surgery of the nose and throat.

MACKENSEN, General August von. See Volume XXIV.

MACKENZIE, *ma-kĕn′zĭ*. Formerly a district of Canada. See Northwest Territories.

MACKENZIE, Sir Alexander (1755–1820). An explorer of the British Northwest. He was born in Inverness, Scotland, but in 1779 emigrated to Canada, where in 1787 he entered the service of the Northwest Company. In 1789 he set out from Fort Chippewyan on Lake Athabasca and explored to its mouth in the Arctic Ocean the great river that now bears his name. Three years later he went on a second exploring expedition; this time he ascended the Peace River, crossed the Rocky Mountains, followed the Fraser for some distance, and then struck overland to the Pacific, which he reached near Cape Menzies. His *Voyages* was published in London in 1801 (new ed., 2 vols., 1904). In the same year he received the honor of knighthood. Mackenzie's explorations led him to affirm the futility of the search for the Northwest Passage.

MACKENZIE, Alexander (1822–92). A Canadian statesman. He was born near Dunkeld, Perthshire, Scotland, Jan. 28, 1822. His early education, three winter terms at an elementary school, he finished at 13, and then began to learn the trade of a stonemason. In 1842 he emigrated to Canada, settling at Kingston, Ontario, where he worked as a stonecutter and afterward became a contractor and builder. In 1847 he removed to Sarnia, where he followed the same occupation; but the results of his self-improving industry were such that in 1852 he undertook, in addition to his regular work, the editorship of the *Lambton Shield*, a newly founded Liberal newspaper. From that time he was chiefly devoted to politics. He was elected a member of the Canada Legislative Assembly in 1861 and at once became conspicuous for his extensive knowledge, debating power, and ready wit. He strongly supported the movement for confederation. In 1865 he was offered, but declined, a seat in the coalition cabinet from which George Brown (q.v.) had retired as the most prominent Liberal member, and which was formed to tide over the crisis then threatening the union of Upper and Lower Canada. (See

CANADA, *History*.) He was accepted in 1867 as Liberal Opposition leader in the Legislative Assembly, and in 1873 was formally elected to that position in the Dominion Parliament. From December, 1871, until October, 1872, when dual representation was abolished, he was a member of the House of Commons and also Treasurer in the Ontario cabinet of Edward Blake (q.v.). In 1873 Sir John A. Macdonald was compelled to resign by reason of the revelations in connection with the Pacific [Railway] Scandal, and Mackenzie became the first Liberal Premier of the Dominion. His administration was remarkable for its honesty and efficiency, though it had to contend with a severe industrial depression and with the opposition of British Columbia, due to slow construction of the Canadian Pacific Railway. The introduction of vote by ballot (1874), the creation of the Supreme Court of Canada (1875), the organization of a territorial government for the Northwest Territories independent of Manitoba, the Canada Temperance Act, providing local option—these and other useful measures testified to the vigor and statesmanship of his government; while hardly less important were the changes procured by it in the instructions of the Imperial government to the Governor-General of Canada, by which the latter became practically bound to accept the advice of the Dominion cabinet. He obtained also favorable consideration of Canada's right to be represented by native diplomatists in negotiations with foreign countries where Canadian interests were involved. In 1878 he was defeated by the advocates of a protective policy under the leadership of Sir John A. Macdonald. He again led the Liberal Opposition (1878–80), but retired on account of ill health, though retaining a seat in Parliament until his death. He visited Britain in 1875 and in 1883 and was received with much distinction. He thrice declined knighthood. His death took place at Toronto, April 17, 1892. He published *The Life and Speeches of George Brown* (1882). Consult William Buckingham and Sir G. W. Ross, *Life and Times of Alexander Mackenzie* (Toronto, 1892).

MACKENZIE, SIR ALEXANDER CAMPBELL (1847–). A Scottish composer, born at Edinburgh. At 10 he was sent to Sondershausen, Germany, to study music. He returned home in 1862, competed for the King's scholarship at the Royal Academy of Music, and was successful. Upon the completion of his academy course he returned to Edinburgh in 1865 and became favorably known as a solo violinist. In 1873 he became conductor of the Scotch Vocal Musical Association. Owing to poor health, he spent the greater part of the time from 1875 to 1885 in Florence. He returned to England and in 1885 conducted the oratorio concerts which Messrs. Novello had inaugurated. He became principal of the Royal Academy of Music in 1888. From 1892 to 1899 he was conductor of the London Philharmonic Society. In 1895 he received the honor of knighthood from Queen Victoria. His music is in the classic mode and betrays his German training throughout; at the same time in a measure he succeeded in introducing the Scottish note in many of his national compositions. His more important works are the operas *Colomba* (1883), *The Troubadour* (1886), *The Cricket on the Hearth* (1902); the oratorios *The Rose of Sharon* (1884), *Bethlehem* (1894); the cantatas *The Bride, Jason, The Story of Sayid, The Dream of Jubal, The Witch's Daughter;* a concerto for violin and orchestra; a *Scottish Concerto* for piano and orchestra; several overtures and rhapsodies for orchestra; incidental music to *Ravenswood, Marmion, The Little Minister, Coriolanus, Manfred;* three comic operas, *His Majesty, Phœbe, The Knights of the Road;* piano pieces; songs.

MACKENZIE, ALEXANDER SLIDELL (1803–48). An American naval officer, born in New York City. His family name was Slidell, his brother being the celebrated Senator John Slidell; but in 1837 he assumed the name Mackenzie in honor of a maternal uncle. Entering the United States navy as midshipman in 1815, he became a lieutenant in 1825 and a commander in 1841. In 1842, while he was in command of the brig *Somers*, on its return from the West African coast, a conspiracy was thought to have been discovered among the naval apprentices who constituted the crew, and Mackenzie promptly arrested three men, who on December 1 were hanged from the yardarm in pursuance of the recommendation of a council of officers. One of these men, and apparently the ringleader, was John C. Spencer, the son of the Secretary of War. The affair created widespread excitement, Mackenzie being warmly commended in some quarters and bitterly attacked in others. A court of inquiry, and later a court-martial, completely exonerated him from all charges, though the attacks upon him continued and embittered the whole of his subsequent life. In the Mexican War he was ordnance officer at the siege of Vera Cruz and commanded the artillery division which stormed Tabasco (June 16, 1847). He was a facile and pleasing writer and published a number of books, including: *A Year in Spain by a Young American* (1829); *Popular Essays on Naval Subjects* (1833); *The American in England* (1835); *Spain Revisited* (1836); *Life of John Paul Jones* (1841); *Life of Commodore O. H. Perry* (1841); *Life of Commodore Stephen Decatur*, in Sparks's "American Biography." Consult: *The Case of the Somers: Defense of A. S. Mackenzie* (New York, 1843); and, on the other side, James Fenimore Cooper, *The Cruise of the Somers* (ib., 1844); F. J. Turner, *Rise of the New West* (ib., 1906); G. P. Garrison, *Westward Extension* (ib., 1906).

MACKENZIE, ARTHUR STANLEY (1865–). A Canadian physicist, born at Pictou, Nova Scotia, and educated at Dalhousie University, Halifax, and at Johns Hopkins. He was instructor in mathematics at Dalhousie (1887–89); at Bryn Mawr College (Pa.) was lecturer and associate in physics (1891–92), associate professor (1894–97), and professor (1897–1905); then returned to Dalhousie to be Munro professor of physics (1905–10), in 1911 becoming president of that university. He was made a fellow of the Royal Society of Canada in 1908 and was elected a member of the Nova Scotia Institute of Science, of the American Physical Society, and of the American Philosophical Society. His scientific papers were published in the *Physical Review*, *Journal of the Franklin Institute*, and *Proceedings of the American Philosophical Society*. He also translated and edited a collection of memoirs on *The Laws of Gravitation* (1900).

MACKENZIE, CHARLES FREDERICK (1825–62). A Church of England bishop of Central Africa. He was born at Portmore, Peeblesshire, Scotland; graduated B.A. at Cambridge, 1848, where he was fellow and tutor. In 1855 he went to Natal with Bishop Colenso and worked among the English settlers till 1859. In 1860 he became head of the Universities' Mission to Central Africa and Bishop. He worked among the savages in the Manganja country and died at Malo, Jan. 31, 1862. Consult his *Life* by Goodwin (2d ed., Cambridge, 1865).

MACKENZIE, Compton (1883–). An English author, born at West Hartlepool. He was educated at St. Paul's School and at Magdalen College, Oxford, and was one of the founders and editor in 1902–04 of *The Oxford Point of View.* He became associated with H. G. Pélissier of the Follies in plotting and producing plays. His own dramatic works include *The Gentleman in Grey* (1906) and *Carnival* (1912), which, in the form of a novel, ran through six editions in a year. He published also: *Poems* (1907); *The Passionate Elopement* (1911); *Kensington Rhymes* (1912); *Sinister Street* (2 vols., 1913–14), a novel, the first volume appearing in New York under the title *Youth's Encounter.*

MACKENZIE, Sir George (1636–91). A Scottish lawyer, author, and politician. The son of Simon Mackenzie, brother of the Earl of Seaforth, he was born at Dundee, studied Greek and philosophy at St. Andrews and Aberdeen, and civil law at Bourges in France. Returning to Scotland, he was called to the bar in 1659, and two years later he distinguished himself as counsel for the Marquis of Argyll, then tried by a commission of Parliament for high treason. About the same time he was made a justice depute, shortly afterward was knighted, entered the Scottish Parliament in 1669 as member for Ross-shire, and in 1677 was named king's advocate. Up to this point his career had been marked by a patriotic spirit, and he was one of the most popular men in the country. As criminal prosecutor in the memorable days of the Covenant, however, he earned for himself the name of the "bluidy Mackenzie" by his overbearing disposition, application of torture, and cruel sentences. He wrote a defense of his methods, entitled *A Vindication of the Government of Charles II.* In the midst of his professional labors he had assiduously devoted himself to literature and in 1663 published *Religio Stoici, or a Short Discourse upon Several Divine and Moral Subjects;* in 1665 his *Moral Essay upon Solitude;* and in 1667 his *Moral Gallantry.* In 1678 appeared his *Discourse on the Laws and Customs of Scotland in Matters Criminal;* in 1684 his *Institutions of the Laws of Scotland;* and shortly after he took the leading part in founding the Advocates' Library. He retired to Oxford in 1690 and died in Westminster the following year. Consult Andrew Lang, *Sir George Mackenzie . . . his Life and Times* (London, 1909).

MACKENZIE, George Henry (1837–91). An American chess player, born in Scotland. He entered the English army and served several years in India. Coming to the United States, he served in the Federal army during the Civil War, rising to be captain. He first became known as a chess player in 1862, when he won the first prize in the handicap at the international chess contest in London, Anderssen being his opponent. In 1865 he came to New York, where he wrote on chess matters for *Turf, Field, and Farm.* He won the first prizes at the annual contests of the New York Chess Club in 1865, 1866, 1867, and 1868. He played in the international chess contests at New York, 1876; Paris, 1878; Vienna, 1882; London, 1883; Frankfort, 1887, where he won the championship of the world; and Manchester, England, 1890.

MACKENZIE, Henry (1745–1831). A Scottish novelist, born in Edinburgh and educated at the high school and University of Edinburgh. He practiced as an advocate there. In 1804 he was appointed comptroller of taxes for Scotland. His *Man of Feeling* (1771), *Man of the World* (1773), and *Julia de Roubigné* (1777) won for him a rather high place among the authors of his time. There is in all these novels something of the minuteness of Richardson, with a peculiar soft and sentimental tone, partly derived from Sterne. In 1779 Mackenzie began a periodical called the *Mirror* (modeled after the *Spectator*), which lasted for 17 months. It was followed by the *Lounger* (1785–87). *The Man of Feeling,* one of the classics in sentimental literature, is published in Cassell's National Library.

MACKENZIE, James Cameron (1852–). An American educator, born in Aberdeen, Scotland. He came to America when he was a boy, studied in the public schools of Wilkes-Barre, Pa., in the Bloomsburg Normal School of the same State, at Phillips Exeter Academy, and at Lafayette College, where he graduated in 1878. After studying theology at Princeton, he organized in 1882 and was head master until 1899 of the Lawrenceville (N. J.) School for boys. After a few months abroad he was made director of Tome Institute, Port Deposit, Md. (1899). In 1901 he founded the Mackenzie School at Dobbs Ferry, N. Y., of which he was thereafter director. He was one of the three organizers, and president in 1897, of the Headmasters' Association, in 1898 was president of the Association of Colleges and Preparatory Schools of the Middle States and Maryland, and at the time of the Chicago World's Fair (1893) he served as chairman of the International Congress of Secondary Education.

MACKENZIE, John Joseph (1865–). A Canadian pathologist and bacteriologist. He was born at St. Thomas, Ontario, and was educated at Toronto, Leipzig, and Berlin universities. He was for some time fellow in biology, Toronto University, and later was appointed bacteriologist to the Ontario Board of Health. In 1900 he became professor of pathology and bacteriology in Toronto University. He was made fellow of the Royal Society of Canada (1909), president of the Canadian Institute (1909), and a member of the Society of American Bacteriologists and of the American Association of Pathologists and Bacteriologists. He contributed scientific papers to the medical press and published *Recent Theories in Regard to the Causes of Immunity to Infectious Disease* (1907).

MACKENZIE, John Stuart (1860–). A British philosopher, born near Glasgow, and educated at Glasgow, Cambridge, and Berlin. In 1884–89 he was a fellow at Edinburgh and from 1890 to 1896 fellow of Trinity College, Cambridge. He lectured on political economy at Owens College, Manchester, in 1890–93, and in 1895 became professor of logic and philosophy in University College, Cardiff. Mackenzie is a Hegelian of the type of Green and Caird. He wrote: *An Introduction to Social Philosophy: The Shaw Fellowship Lectures at Glasgow* (1890; 2d ed., 1895); *A Man-*

ual of Ethics (1893; 7th ed., 1910); *Outlines of Metaphysics* (1902; 2d ed., 1906); *Lectures on Humanism* (1907).

MACKENZIE, Montague Muir-. See Muir-Mackenzie.

MACKENZIE, Sir Morell (1837–92). An eminent English laryngologist. Born at Leytonstone, Essex, the son of a physician, he received his professional education at the London Hospital Medical College, where he took his degree in 1862, and at Paris and Budapest. At the latter city he met Czermak, who taught him the use of the laryngoscope, in the employment of which he soon became an expert, and which on his return he introduced in London. In 1860 he became connected with the London Hospital and held successively the posts of resident medical officer, registrar, assistant physician, and physician until 1874, when he resigned. He founded the London Throat Hospital in 1863. His operative skill soon made him the most prominent man in his specialty in England and led to his appointment in 1887 to attend the Crown Prince of Germany, afterward Emperor Frederick III, who was attacked with cancer of the throat. In spite of bitter controversies with the German physicians in attendance, Mackenzie remained with the Emperor until his death in 1888. For these services he was knighted by Queen Victoria and received the Grand Cross and Star of the Hohenzollern Order of Prussia. He was the first president of the British Laryngological Society, president of the laryngological section of the international medical congress held at Copenhagen in 1884, was a corresponding member of the Royal Society of Vienna and of the Medical Society of Prague, and an honorary fellow of the American Laryngological Association. His more important works are: *The Use of the Laryngoscope* (London, 1866); *Essay on Growths in the Larynx* (ib., 1871); *A Manual of Diseases of the Throat and Nose* (New York, 1880); *The Hygiene of the Vocal Organs* (London, 1886); *The Fatal Illness of Frederick the Noble* (ib., 1888).

MACKENZIE, Ranald Slidell (1840–89). An American soldier, born in Westchester Co., N. Y., son of Alexander Slidell Mackenzie. He entered Williams College, but soon went to West Point, where he graduated with first honors in 1862. He received a commission in the engineer corps, was sent to the front, and was wounded in the second battle of Bull Run. During the following years he took part in all the campaigns of the Army of the Potomac, was four times brevetted for "gallant and meritorious services," and on July 10, 1864, when only 24 years of age, was appointed colonel of the Second Connecticut Heavy Artillery, and given command of a brigade. During the closing years of the war he participated in the Shenandoah campaign and commanded a cavalry division under General Sheridan during the operations which culminated at Appomattox. After the conclusion of the war Mackenzie was stationed on the western frontier, where he performed efficient service against the hostile Indian tribes. During one of his expeditions against the Kickapoos and Lipans he pursued them into Mexico and punished them severely. The Mexican government objected to this violation of its territory and made it the subject of considerable diplomatic correspondence, but the authorities at Washington upheld General Mackenzie. He was appointed a brigadier general in the regular army in 1882 and retired from active service on March 24, 1884.

McKENZIE, Robert Tait (1867–). An American sculptor and physical director. He was born at Almonte, Ontario, and graduated from McGill University, Montreal (A.B., 1889; M.D., 1892). After some years of medical practice he was appointed demonstrator (1895) and afterward lecturer on anatomy at McGill University and in 1904 professor and director of the department of physical education at the University of Pennsylvania. He contributed many valuable technical articles to periodicals, and wrote two books, *The Barnjum Barbell Drill* and *Exercise in Education and Medicine.* He was a president of the Society of Directors of Physical Education in Colleges, and in 1912–13 president of the American Physical Education Association. But, although he received no regular artistic training, his chief reputation is as a sculptor. In 1902 he resolved to construct the figure of a mathematically perfect man, after comparative measurements made by Dr. P. C. Phillips, of Amherst. The result was "The Sprinter" (Fitzwilliam Museum, Cambridge), embodying the measurements of 89 athletes, a work of high artistic merit. It was exhibited at the Society of American Artists, New York, in 1902, at the Royal Academy, London, and at the Paris Salon. This success was followed by "The Athlete" (Ashmolean Museum, Oxford) and by three statuettes, "The Boxer" (1905), "The Competitor" (1906), and "The Juggler" (1907), the last two being in the Metropolitan Museum, New York. All these works reveal originality of conception, mastery of technical anatomy, skillful management of light and shade, and a strong sense of symmetry. Moreover, they are inherently beautiful. McKenzie's later achievements include "The Onslaught" (1911), an original group typifying the spirit of the football game; "The Relay," a statuette (Ottawa Gallery); and "The Youth Benjamin Franklin" (1913), a bronze statue at the University of Pennsylvania. He also modeled a few excellent portraits in low relief, including Samuel Jackson and Nathaniel Chapman (University of Pennsylvania) and Dr. Brown (McGill University).

MACKENZIE, Sir William (1849–). A Canadian railway builder and president. He was born at Kirkfield, Ontario, and was educated in the public schools. He was first a public-school teacher and afterward engaged in the lumber business. His career as a railway builder began with a contract to construct the Midland Division of the Grand Trunk Railway, and this was followed by construction of a portion of the Mountain Division of the Canadian Pacific Railway. He became a partner of Sir Donald Mann in 1886, with whom he then began construction of sections of railway now united under one administration and known as the Canadian Northern Railway. (See Canada, *Transportation.*) Mackenzie became president of, or a director in, a large number of railway, industrial, and financial corporations. He was elected president of the Canadian Northern and was largely instrumental in procuring legislation whereby in 1913 the Dominion financially aided the railway. In 1911 he was knighted.

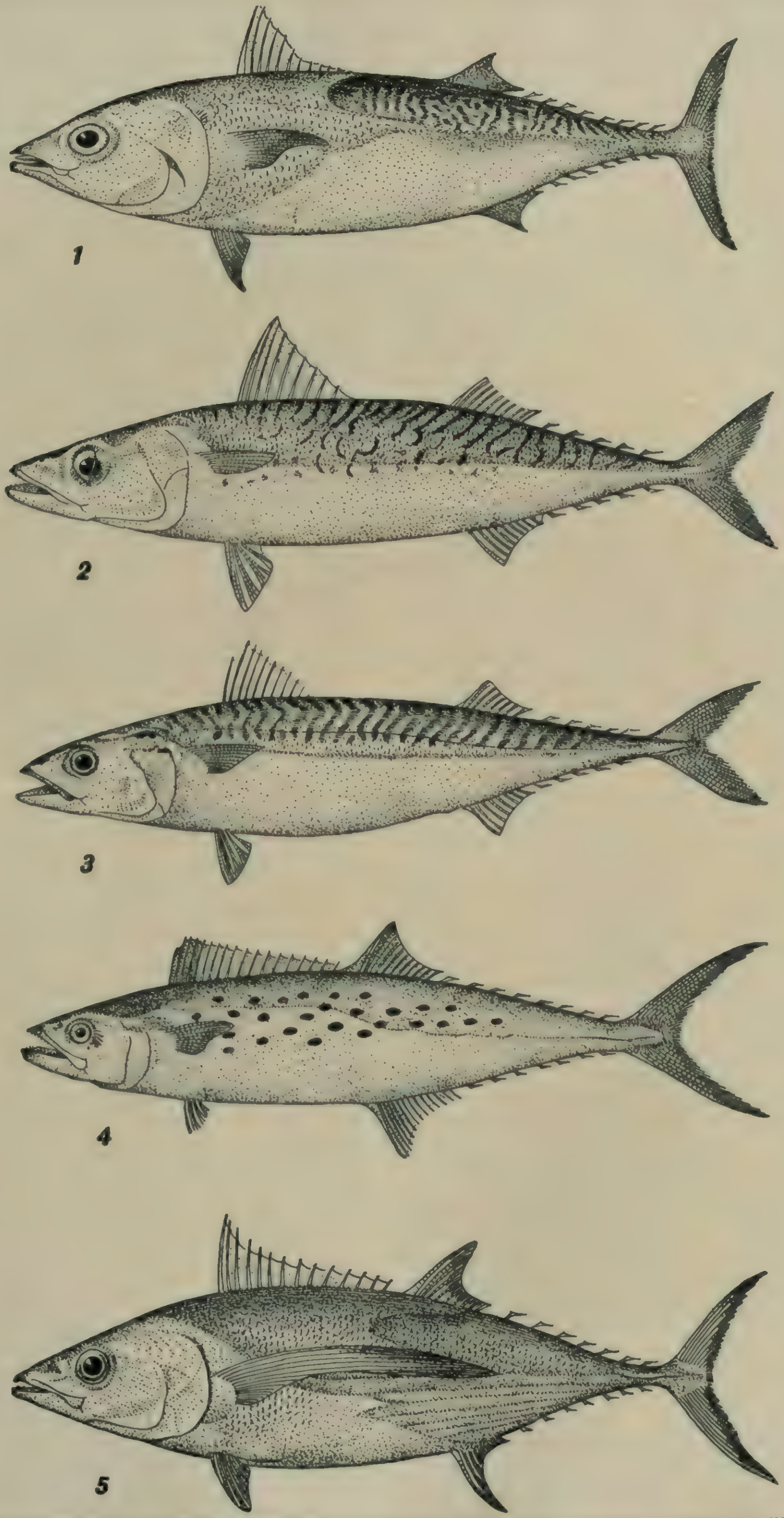
MACKENZIE, William Douglas (1859–). An American Congregational theologian. He was born at Fauresmith, Orange River

Colony, South Africa, and was educated in Edinburgh at Watson's College School (1875), at the University (M.A., 1881), and at the Congregational Theological Hall (1880–82). He was then ordained to the ministry. In 1886 he studied at Göttingen. Coming to the United States, he was professor of systematic theology at Chicago Theological Seminary from 1895 to 1903, and president of Hartford Seminary after 1904. Honorary degrees were given him by Beloit College and Wesleyan, Yale, Princeton, and Edinburgh Universities. He is author of *The Ethics of Gambling* (1893; new ed., 1911); *The Revelation of Christ* (1896); *Christianity and the Progress of Man* (1897); *South Africa: Its History, Heroes, and Wars* (1899); a biography of his father, *John Mackenzie, South African Missionary and Statesman* (1902); *The Final Faith* (1910); *Galatians and Romans*, in the Westminster New Testament (1912).

MACKENZIE, William Lyon (1795–1861). Leader of the rebellion of 1837–38 in Upper Canada. He was born at Dundee, Scotland, March 12, 1795, emigrated to Canada in 1820, and settled first at York (Toronto) and later at Queenston, where he opened a bookstore and in 1824 began the publication of a newspaper entitled the *Colonial Advocate*, in which he fiercely assailed the government. He soon afterward removed to York, the capital of Upper Canada, where he made himself a political factor. In 1828 he was elected to the Legislature. In 1830 he was reëlected, but the Assembly refused to receive him on account of an alleged libel on the ministry. He was then four times reëlected and each time expelled. The government then, to prevent a recurrence of the trouble, refused to issue writs for another election. In 1829 he visited the United States, and in 1832 he was sent to England as the delegate of his party to secure the redress of certain abuses and the removal of certain officials—a mission which he successfully accomplished. After his return he was, in 1834, chosen the first mayor of the city of Toronto, formerly the town of York, and in the following October was again elected to the Assembly, where, his party being now in the majority, he was regularly seated. Two months later, Dec. 9, 1834, he founded the Canadian Alliance Society, through the instrumentality of which he hoped to effect his reforms. Meantime he acted as chairman of a committee of grievances appointed by the Assembly, and this committee submitted a report complaining among various things of the extent of the patronage of the crown and of the small share which the Legislature had in disposing of the revenues. One of the results of this report was the recall of the Governor, Sir John Colborne. Meanwhile a large element of the French inhabitants of Lower Canada were organizing in opposition to the British régime, and in 1835 Mackenzie was sent by his party to visit their leader, Louis J. Papineau (q.v.). In 1836 Mackenzie and all other prominent Reformers failed of reëlection to the Assembly, and from this time events moved rapidly in the direction of rebellion. The *Colonial Advocate* had not appeared since 1834, but in 1837 Mackenzie started a new paper, the *Constitution*, in which he advocated a Republican form of government, applauded the people of Lower Canada, who were on the brink of open insurrection, and on August 2 published the *Declaration of the Reformers of Toronto to their Fellow Reformers in Lower Canada*, which has been called the declaration of independence of Upper Canada. On Nov. 25, 1837, Mackenzie proclaimed the establishment of a provisional government. Soon afterward between 700 and 800 men gathered under his leadership for the purpose of marching on the capital and setting up an independent government; but delays gave the Governor, Sir Francis Bond Head, time to prepare for defense, so that when they finally did advance they were met on the evening of December 5 by a small body of Loyalists, who fired one volley, whereupon both sides retreated at full speed. Two days later the Governor marched out at the head of his forces and attacked the Reformers at Montgomery's Farm and after a brief engagement utterly defeated them. Mackenzie escaped to the United States, where he found many sympathizers and with their help set about organizing an expedition, establishing his headquarters on Navy Island in the Niagara River. Not long afterward, while in Buffalo, he was arrested for violating the neutrality laws of the United States, was convicted, and was imprisoned at Rochester until pardoned on May 10, 1840. After his release he was employed in the New York Custom House and later on the New York *Tribune*. On Feb. 1, 1849, the Canadian government granted a general amnesty to all who had taken part in the rebellion, and Mackenzie then returned to Toronto and was once more elected to the Legislature, in which he served from 1851 to 1858. He died Aug. 29, 1861. Among his publications are: *Sketches of Canada and the United States* (1833); *Lives and Opinions of Benjamin Franklin Butler and Jesse Hoyt* (1845); *Life and Times of Martin Van Buren* (1846). Consult: Charles Lindsay, *Life and Times of William Lyon Mackenzie* (Toronto, 1862; new ed., 1908, in "The Makers of Canada Series"); J. C. Dent, *Story of the Upper Canadian Rebellion* (ib., 1885); John King, *The Other Side of the Story* (ib., 1886); D. B. Read, *The Canadian Rebellion of 1837* (ib., 1896); William Kingsford, *The History of Canada*, vol. x (ib., 1898).

MACKENZIE RIVER. A river of the Dominion of Canada, one of the longest streams of North America, first explored in 1789 by Alexander Mackenzie, from whom it derives its name (Map: Canada, D 3). It has its origin under the name of Athabasca River near Mount Brown, in the Rocky Mountains, on the eastern borders of British Columbia, and after a north-northeast course of 687 miles falls into Lake Athabasca. Emerging from this lake as the Slave River, it receives the Peace River and after another course of 210 miles empties into Great Slave Lake (q.v.). It thence assumes the name of Mackenzie River and conveys the waters of Great Slave Lake to the Arctic Ocean at Mackenzie Bay. Estimated total length, 2500 miles; area of basin, 590,000 square miles. After leaving Great Slave Lake it receives the waters of Great Bear Lake. Its upper course lies through a fertile and well-timbered district, and there is an extensive deposit of lignite along its lower course and delta. On its banks are Forts Simpson, Norman, and Good Hope. In many places it is more than a mile in width, and during the summer months is navigable with the Slave River for 1200 miles to Fort Smith, and between the latter to Lesser Slave Lake for 625 miles farther with one obstruction (Grand Rapids).

MACKERELS



1. TUNNY (Thunnus thynnus).
2. CHUB MACKEREL (Scomber colias).
3. COMMON MACKEREL (Scomber scombrus).
4. SPANISH MACKEREL (Scomberomorus maculatus).
5. ALBACORE (Germo alalonga).

MACK'EREL (OF. *makerel, maquerel, maquereau,* Fr. *maquereau,* from ML. *macrellus,* mackerel, probably from Lat. *macula,* spot). A fish of the spiny-rayed family Scombridæ and especially of the typical genus *Scomber.* The body is spindle-shaped and compressed, with a slender caudal peduncle, keeled on each side, and a crescent-shaped tail. There are two dorsal fins, the posterior one succeeded by from five to nine finlets. The common mackerel (*Scomber scombrus*) is abundant on both sides of the North Atlantic, south to Spain, in Europe, and Cape Hatteras in America. It is a very beautiful fish, brilliant green and blue above, with about 35 wavy black transverse streaks, and silvery below. The average length is about 12 inches, such a fish weighing about a pound. Occasionally one finds a specimen 20 inches in length with a weight of 3 to 4 pounds. Maturity is reached about the fourth year. Young mackerel are variously called spikes, blinkers, and tinkers, according to their size. The mackerel appear along the coast in spring in immense schools, often estimated to contain hundreds of thousands of barrels, wandering widely and voraciously feeding upon anything smaller than themselves, mainly young fishes, and withdraw again in the fall to deeper, warmer waters. They spawn in May, June, and July on the American coast. The eggs are very minute and at first float at the surface, but subsequently gradually sink to the bottom. A single female may contain as many as 200,000 eggs, and, during the summer of 1896, 24,000,000 mackerel eggs were artificially hatched by the United States Fish Commission.

There are only a few species of mackerel, but these are widely distributed and everywhere highly valued as food. The flesh, especially of the common species, is excellent when eaten fresh and is salted in very great quantities. The mackerel fisheries (see FISHERIES) are among the most important in both Europe and America. The principal fishing station in the United States is Gloucester, Mass. About 1000 vessels were employed in former years, but now the number has been reduced to less than 500. The chub mackerel (*Scomber colias*) is found in both the Atlantic and Pacific oceans. The immense horse mackerel (*Thunnus thynnus*), pelagic and found in both oceans, reaches a length of 10 feet and a weight of 1500 pounds. The flesh is excellent, and large numbers of the fish are caught by Europeans. (See TUNNY.) The Spanish mackerel (*Scomberomorus maculatus*) occurs on both coasts of the United States, attaining a weight of eight or nine pounds, and is a most excellent food fish. Consult Goode, *Fishery Industries,* sec. i (Washington, 1884), and other works cited under FISH and under FISHERIES. See Plate of MACKERELS.

MACKEREL GUIDE. A British name for a gar (q.v.).

MACKEREL GULL (so called because of feeding on mackerel). Any of several of the smaller gulls, as the laughing gull. In New Zealand a small and numerous species locally called tarpunga, which plunders oyster catchers and other shore birds of food.

MACKEREL MIDGE. A British name for any local species of codling.

MACKEREL SHARK. See PORBEAGLE.

MACK'EY, ALBERT GALLATIN (1807–81). An American writer on Freemasonry. He was born at Charleston, S. C., and was educated there for the practice of medicine, which he later relinquished for literature and especially that pertaining to Freemasonry. In 1850 he established in Charleston a Masonic monthly magazine and in 1858 a quarterly in the same interest. His chief works include: *Cryptic Masonry* and *Masonic Ritualist* (1867); *Symbolism of Freemasonry* (1869); *A Text-Book of Masonic Jurisprudence* (1869); *Encyclopædia of Freemasonry* (1874; new ed., 1906).

McKIB'BIN, CHAMBERS (1841–). An American soldier, born in Pittsburgh, Pa. He enlisted (1862) in the regular army and in 1866 was promoted to be captain. He had been made brevet captain in 1864 for gallant conduct at the battle of North Anna River, Va., and operations on the Weldon Railroad during the Civil War. In 1892 he was promoted to be major, and in 1898, as lieutenant colonel of the Twenty-fifth Infantry, he participated in the invasion of Cuba, took part in the battle of Santiago, and received in official reports special mention for distinguished service. The same year he was made brigadier general of volunteers and was appointed military governor of Santiago de Cuba, in which office he was succeeded by Gen. Leonard Wood. He was honorably discharged from the volunteer service in 1899, was put in command of the Department of Texas, and in 1901 was transferred to the command of an infantry regiment, U. S. A. He was made brigadier general in 1902 and was retired the same year.

McKIM', CHARLES FOLLEN (1847–1909). A distinguished American architect, son of J. M. McKim. He was born in Chester Co., Pa., Aug. 24, 1847, and was educated at Harvard University and at the Ecole des Beaux-Arts, Paris. In conjunction with his partners, W. R. Mead and Stanford White, he contributed greatly to the improvement of architecture in the United States. He made designs for the Boston Public Library; the Library and other buildings of Columbia University, the Bowery Savings Bank, and the Morgan Library, all in New York; the Agricultural Building at the Columbian Exhibition in Chicago (1893); the great scheme for the improvement of Washington, D. C. (in conjunction with D. H. Burnham and F. L. Olmsted, Jr.); and the magnificent Pennsylvania Railway Station in New York, completed after his death. In other works, like the Madison Square Garden, Washington Arch, Century, Metropolitan, University and other clubs, and the Library and Hall of Fame of New York University, all in New York, Mr. McKim's hand is less predominant, but still evident. His success was in large measure due to an admirable skill in producing large monumental effects, chiefly with adaptations of classic and Renaissance motives, and to a refined taste combined with a highly developed decorative sense. He was a member of the American Academy of Arts and Letters.

McKIM, JAMES MILLER (1810–74). An American Abolitionist, born in Carlisle, Pa. He studied at Dickinson College and at Princeton and then entered the ministry of the Presbyterian church, but soon after the organization of the American antislavery movement left the pulpit to devote himself to the cause of emancipation, which he served with marked ability until near the close of the Civil War, as lecturer, organizer, corresponding secretary of the Pennsylvania Antislavery Society, and editor at times of the *Pennsylvania Freeman.* When the emancipation of the slaves was proclaimed by President Lincoln he resigned his office in the antislavery society to devote himself to the work of the Freedmen's Aid Commission, where his earnest devotion and wide experience were of the greatest value.

MACKINAC (măk′ĭ-nạ) **ISLAND.** A city in Mackinac Co., Mich., on an island of the same name, situated in the Strait of Mackinac connecting lakes Huron and Michigan, 260 miles north by west of Detroit (Map: Michigan, E 3). The island, 3 miles in length by 2 in width, is rocky and densely wooded, contains a State park, and is a popular place of resort, noted for its healthful climate and picturesqueness. On this island is one of the oldest white settlements in the interior of North America, it having been a trading post in the latter part of the seventeenth century. In 1810 it had about 1000 inhabitants. Old Fort Mackinac, one of the oldest fortifications now standing in the United States, commands the strait. Fort Mackinac, on an elevation back of the city, which is situated on the southern shore, commands the strait. The village of Mackinac Island received a city charter in 1900. Pop., 1900, 665; 1910, 714.

MACKINAW (măk′ĭ-nạ) **TROUT.** See NAMAYCUSH.

McKINLEY, MOUNT (called by the Russians *Bolshaya* and by the Shushitna Indians *Traleyka*). The highest peak of North America. It is situated in south central Alaska between the sources of the Kuskokwim and the Shushitna rivers, 150 miles north of the head of Cook Inlet (Map: Alaska, H 4). Its altitude is put by the United States Coast and Geodetic Survey at 20,464 feet. In 1912 Belmore Browne and Herschel C. Parker ascended to 20,300 feet, and on June 7, 1913, Dr. Hudson Stuck reached the summit, c.20,500 feet.

Bibliography. A. H. Brooks, "An Exploration to Mount McKinley, America's Highest Mountain," in *Smithsonian Institution, Annual Report*, 1903 (Washington, 1904); F. A. Cook, *To the Top of the Continent* (New York, 1908); A. H. Brooks, "Mount McKinley Region," in *United States Geological Survey, Professional Paper No. 70* (Washington, 1911); Belmore Browne, *The Conquest of Mount McKinley* (New York, 1913); Hudson Stuck, *Ascent of Denali, Mount McKinley* (ib., 1914); E. S. Balch, *Mount McKinley and Mountain Climbers' Proofs* (Philadelphia, 1914).

McKIN′LEY, WILLIAM (1843–1901). The twenty-fifth President of the United States, born at Niles, Ohio, Jan. 29, 1843, of Scotch-Irish ancestry. His great-grandfather, David McKinley, a soldier of the Revolution, was a resident of York Co., Pa., and removed thence to Ohio, where, in 1829, his grandson William married Nancy Allison. From this marriage came nine children, the seventh of whom was William, the future President. He was early engaged, as had been his father and grandfather before him, in the iron industry. He secured, however, some education at the Poland Academy, and later entered Allegheny College, at Meadville, Pa., although he soon withdrew and engaged in teaching school. He was thus occupied at the outbreak of the Civil War, and early enlisted, being mustered into the Twenty-third Ohio Volunteers on June 11, 1861. The colonel of the regiment was William S. Rosecrans and its lieutenant colonel Stanley Matthews, while Rutherford B. Hayes later served as colonel. The regiment served first under General McClellan in West Virginia, but in 1862 it was transferred to Washington and later took an active share in the battles of South Mountain and Antietam. McKinley was made commissary sergeant at the close of the first winter's service and especially distinguished himself at Antietam when, at great personal risk, he carried a supply of food from the rear to the soldiers at the front. For this gallantry he was recommended for promotion by Colonel Hayes, and under date of Sept. 23, 1862, was made second lieutenant, and on Feb. 7, 1863, was commissioned first lieutenant. McKinley continued with his regiment throughout the war, serving as an aid both to General Hancock and to General Crook, repeatedly rendering effective services, and gaining particular prominence by his work at Opequan Creek, Fisher's Hill, and Cedar Creek, for which he was brevetted major on March 13, 1865. He had already, on July 25, 1864, been commissioned captain, but the brevet title was that by which he was commonly known in later life.

Major McKinley was mustered out of the volunteer service on July 25, 1865, and immediately took up the study of law in the office of Judge Glidden, completing his preparation by a course at the Albany Law School. Being admitted to the bar in 1867, he established himself at Canton, Ohio, his home for the remainder of his life, and although Stark County was Democratic, he, a Republican, was elected its prosecuting attorney in 1869. In 1875, when the Republican candidate for Governor was Colonel Hayes, McKinley took an active part in the campaign and began to attract national attention by his speeches in favor of the resumption of specie payments. He was himself elected to Congress in the year following, and served in the Lower House for seven consecutive terms in spite of repeated attempts of the Democrats to gerrymander him home. In his first term, in connection with the Wood Tariff Bill, he upheld the protectionist policy, although his early views on the subject have been considered as less positive than those which he expressed in his later years. Not only upon that subject did the development of his views seem to some to show inconsistencies, but also with reference to financial questions was there an even more marked change, inasmuch as he stood with the Western wing of his party in favor of the remonetization of silver, and voted for the Bland-Allison Bill, even against the veto of President Hayes. When Garfield was transferred to the Senate, McKinley succeeded him as a member of the Ways and Means Committee of the House. In the same term he spoke vigorously against the repeal of the Federal Election Law, and his speech on the subject was used as a campaign document in 1880. In that campaign he served as a member of the Republican National Committee, was chairman of the Ohio State Convention, and was himself reëlected to Congress. In the next national campaign also he took an active part, drafting the tariff plank in the Republican platform. In the succeeding administration he became a leader in opposition to the Mills Bill and to President Cleveland's plan of tariff reform. Again in the campaign of 1888 he prepared the tariff plank of the Republican platform, being chairman of the Committee on Resolutions. He was one of the managers of the campaign of John Sherman, although at one time it seemed that the convention would be turned to himself. He prevented that contingency, however, by a vigorous speech. By this time he was recognized as a distinctively national leader, and although Thomas B. Reed secured the speakership of the House, McKinley was made chairman of the Committee on Ways and Means, and in that position framed and carried through Congress the highly protectionist tariff which bears his name. (See TARIFF.) In the election of 1890 he was defeated. Ending his congressional service in 1891, he was in the same year elected Governor of Ohio by a plurality of more than 21,000 over Campbell, who in 1890 had carried the State by 11,000, and the success was emphasized in 1893, when McKinley was reëlected by about 81,000 plurality. The four years of his service as Governor were marked by the establishment of a State Board of Arbitration, by improvement in the organization of the National Guard, and by other evidences of effective administration. His administrations as Governor were in general such as to enhance his reputation outside of his State and to mark him still more plainly as a national leader. He was thus the natural and the leading candidate before the St. Louis Convention in 1896, where on the first ballot he received 661½ votes out of a total of 906. Coming out now strongly for the gold standard, in accordance with his party's platform, he quieted the fears aroused by his earlier course and even by his support of the Sherman Bill so late as 1890, and took a vigorous lead in the work against the free-silver campaign of Bryan. His personal campaign was unusual in that he remained at Canton throughout, making, however, some 300 speeches from his own porch and there addressing in the aggregate probably 1,000,000 persons. Although he received in the popular vote a plurality of only about 600,000 votes in a total of more than 14,000,000 votes, he nevertheless received 271 electoral votes as against 176 cast for Bryan. McKinley's first administration was characterized particularly by the events and policies incident to the acquisition of extensive colonial possessions. The war with Spain, precipitated by the conditions in Cuba, resulted through the Treaty of Dec. 10, 1898, in the annexation of Porto Rico, of the Philippine Islands, and of Guam, upon the payment to Spain of $20,000,000, and resulted also in the termination of Spanish sovereignty in Cuba. For the remainder of McKinley's service as President the efforts of the administration were directed to the organization and maintenance of proper local administration throughout Cuba, to the general improvement of the material and social condition of the people, and to the preparation of the inhabitants for the conduct of a general republican form of government, which was to be instituted under the direction of the President's successor. Equally without precedent in the history of the United States were the exigencies presented in the problem of administering colonial dependencies, a problem which in the early years was made still more difficult by the protracted warfare carried on by portions of the Philippine population. Through the efficiency of the administrators selected by the President, and especially through the effective work of the commission headed by Judge William H. Taft, the close of McKinley's first administration saw the greater portion of the newly acquired islands in a condition of peace and with an orderly administration of government, in which the natives shared, and with most of the attendant circumstances such as to justify the claim that the assumption of the duties of colonial administration had been successfully effected. By this development, however, many new problems, both of politics and of jurisprudence, were presented, and in such a manner as to make impressive the fact that under McKinley the nation had entered upon what in various respects seemed to be a new course of development. Furthermore, during his administration, in August, 1898, the Hawaiian Islands finally became a part of the United States, and two years later received a Territorial government, with the right to a delegate in Congress. At the close of 1899 negotiations were concluded by which the tripartite control of Samoa (q.v.) was terminated, and the United States secured control of Tutuila with the harbor of Pago-Pago. A number of reciprocity treaties were concluded, so that from many points of view the administration seemed engaged in an expansion of influence and of territory through the methods of peace as well as through those of war. As the representative of these lines of policy, and as the one through whom especially these policies had been carried to a successful issue, McKinley gained a position of unusual prestige and was looked upon as embodying the successes which under his lead the people had achieved. In 1900 he was again nominated, and received 292 electoral votes, while Bryan, again his competitor, received only 155. The mass of people came to regard McKinley with an esteem and a confidence rarely shown for so long a period to any public leader. He had in a high degree the ability to foresee the trend of public thought and so to shape his course as to render certain the public approval. Being able to ignore petty controversies, having a fine sense of relative proprieties, and being a man of devotion to high principles, he was regarded as preëminently a good man, while the events of his administration made it natural that he should be regarded by many as one of the few great presidents. His untiring devotion to his invalid wife, Ida Saxton, whom he had married in 1871, and who survived him, aroused the admiration of the whole nation. In the full swing of triumph following his second inauguration and incident to a general recognition of the success of his work in the new possessions, the President was shot by an assassin, Czolgosz (q.v.), while holding a public reception at the Pan-American Exposition at Buffalo, on Sept. 6, 1901. On the day preceding the President had delivered an address on commercial reciprocity among the various nations, and just as he was proposing a policy which might have made his second administration fully as momentous as had been his first, his service was ended in an instant. The surgeons who were summoned operated almost immediately upon the wounded man, and thus made possible the fight for life which was then carried on, and at times with every prospect of success, until finally, on September 14, the President passed away. The actual end came suddenly and made a most profound impression both in the United States and abroad, and the day of the burial was observed throughout the nation with deep sorrow. The interment was at Canton, where his body, with that of his wife, now lies in the imposing McKinley National Monument.

Bibliography. There is no satisfactory collection of McKinley's speeches and addresses and no adequate biography. Among the best brief biographical sketches is that by J. P. Smith in *The Presidents of the United States*, edited by J. G. Wilson, vol. 4 (New York, 1914); also Murat Halstead, *The Illustrious Life of William McKinley* (Chicago, 1901); J. W. Tyler, *Life of William McKinley, Soldier, Statesman, and President* (Philadelphia, 1901); D. R. Dewey, *National Problems* (New York, 1907); J. H. Latané, *America as a World Power* (ib., 1907); E. T. Roe, *The Life of William McKinley* (Chicago, 1913); G. W. Wilson (ed.), *Presidents of the United States*, vol. iv (New York, 1914).

McKINNEL, mak-kĭn′ĕl, NORMAN (1870–). An English actor, born at Maxwelltown, N. B., Canada, and educated at Edinburgh and Leipzig. He first appeared on the stage at Clacton-on-Sea, England, in 1894; made his first London appearance in 1895; played with H. Beerbohm Tree for three years, appearing in *King John* (1899), *Julius Cæsar* (1900), *Twelfth Night* (1901), and *Ulysses* (1902); and was engaged by Sir Henry Irving to support him in *Dante* (1903). Subsequently he played leading parts, as that of the Rev. James Mavor Morell in *Candida* (1904), his favorite rôle; and starred in *The Perfect Lover* (1905), *The Harlequin King* (1906), *Pan and the Young Shepherd* (1906), *Don Juan in Hell* (1907), *Irene Wycherley* (1907), *Grit* (1908), *The Truants* and *Strife* (1909), *The Crisis* (1910), *The Master Builder* (1911), and *The Cat and the Cherub* (1911). In 1912 he gave a notable performance in London and New York as John Rutherford in *Rutherford and Son*, and in 1913 he played in *The Happy Island*.

McKIN′NEY. A city and the county seat of Collin Co., Texas, 32 miles by rail north by east of Dallas, on the Houston and Texas Central and the Missouri, Kansas, and Texas railroads (Map: Texas, D 3). It is in a productive farming region and has extensive cotton interests, the product of its mills being valued at $540,000 annually. Other industrial establishments include grain elevators, bottling works, cotton gins, and oil and flour mills. The city contains a fine courthouse building and owns and operates its water works and electric-light plant. McKinney adopted the commission form of government in 1913. Pop., 1900, 4342; 1910, 4714.

MACKINTOSH, mă̆k′ĭn-tŏsh. An overgarment which has been made waterproof by the application of a solution of India rubber. The name is derived from the inventor, Charles Mackintosh (or Macintosh), of Manchester, who in 1823 applied to cloth a solution of India rubber in coal-tar naphtha and thus made practicable waterproof garments.

MACKINTOSH, HUGH ROSS (1870–). A Scottish theologian. He studied at Edinburgh (George Watson's College, the University, and New College) and at Freiburg, Halle, and Marburg. In 1896 he entered the Free church ministry and, after charges at Tayport and Aberdeen, in 1904 he became professor of systematic theology at New College, Edinburgh. He translated Ritschl's *Justification and Reconciliation* (1900), Loofs's *Anti-Haeckel* (1903), and Wendland's *Miracles and Christianity* (1911); edited, with Caldecott, *Selections from the Literature of Theism* (1904; 2d ed., 1909); and wrote *The Person of Jesus Christ* (1912) and, in the "International Theological Library," *The Doctrine of the Person of Christ* (1912).

MACKINTOSH, SIR JAMES (1765–1832). An English philosopher, born at Aldourie, Inverness-shire, Oct. 24, 1765. He studied at King's College, Aberdeen, where his most intimate companion was Robert Hall (q.v.), afterward the celebrated Baptist preacher. From King's College he proceeded to Edinburgh in 1784 to study medicine; and having in 1787 obtained his diploma, settled in London, where for some time he supported himself by writing for the newspapers. The first work that brought him into notice was his *Vindiciæ Gallicæ* (1791), in reply to Burke's *Reflections on the French Revolution.* In many respects it was considered greatly to have surpassed the philippic against which it was directed, and was not only lauded by the Liberals, but was highly esteemed by Burke himself. Fox, Sheridan, and other leading Whigs sought the author's acquaintance; and when the association of the Friends of the People was formed, he was appointed secretary. About this time he began to turn his attention to the legal profession, and having in 1795 been called to the bar, soon attained high eminence as a forensic lawyer. In 1799 he delivered before the benchers of Lincoln's Inn a course of lectures on the law of nature and of nations which were attended by large audiences. His defense of Peltier (Feb. 21, 1803), charged with libel against Bonaparte, was translated into French by Madame de Staël and scattered broadcast over Europe. In 1806 Mackintosh was appointed a judge of the Vice Admiralty Court at Bombay, where he remained until 1811. After his return to England he entered Parliament as Whig member, first for Nairn (1813) and later for Knaresborough. He was professor of law in the College of Haileybury from 1818 to 1824, and in 1830 became a member of the board of control under the Grey ministry, when, as his last great political effort, he spoke in favor of the Reform Bill. He died May 30, 1832. He wrote *A General View of the Progress of Ethical Philosophy chiefly during the Seventeenth and Eighteenth Centuries* (1832) and a *History of the Revolution in England in 1688* (1834). Prefixed to the latter is "A Notice of the Life, Writings, and Speeches" of Mackintosh by the editor.

MACK′LIN, CHARLES (?1697–1797). A British actor and playwright, born in Ireland in 1697 or a little earlier. His real surname was McLaughlin. After a reckless and wandering youth, he appeared in small parts at Lincoln's Inn Theatre, London (c.1730). Three years later he played important comic rôles at Drury Lane Theatre. In 1735 he quarreled with a brother actor, Hallam, whom he accidentally killed. He was tried for manslaughter and convicted; but he seems to have escaped imprisonment. After many quarrels with Garrick he left Drury Lane (1744) and began to give lessons in acting, an occupation which he kept up almost to the end of his life. In 1744 he opened the Haymarket with a company which he had trained. Macklin soon after this became the mainstay of Drury Lane. In 1753 he quit the stage to open a tavern under the Piazza of Covent Garden. A bankrupt by 1758, he again returned to the stage, acting at various theatres till May, 1789, being then fully 90 years old. He died July 11, 1797, after a life filled with quarrels and lawsuits. His Shylock, which he played for 50 years, was a famous creation. He also excelled in his numerous comic rôles. Of his own plays, only three were printed: *The True-*

born Irishman (1763); *Love à la Mode* (1759), a farce; *The Man of the World* (1781), one of the best comedies of the century. Macklin's *Life* was written by Congreve (London, 1798), turned into sheer romance by Kirkman (ib., 1799), untrustworthily described by Cooke (ib., 1804), and well treated by Parry (ib., 1891).

MACKONOCHIE, mȧ-kŏn′ō-kĭ, Alexander Heriot (1825–87). An English ecclesiastic, famed for his High Church views. He was born at Fareham and was educated at Bath, Exeter, Edinburgh, and at Wadham College, Oxford, where he graduated in 1848. In 1858 he began to work with Charles Fuge Lowder (q.v.) at St. George's in the East, London, and four years after took charge of St. Alban's, Holborn, in a London slum, where he worked for 20 years. Here he officiated at services so elaborate as to be called by Shaftesbury, in 1866, "in outward form . . . the worship of Jupiter or Juno." For his Catholic ritual he was prosecuted again and again—in 1868, 1869, and 1870, in 1874, and in 1882. In the last year he resigned out of respect for the wish of the dying Archbishop Tait, and accepted a charge at St. Peter's, London Docks; but was forced to resign from it (1883), and returned to St. Alban's and worked there unofficially. He was found dead in the snow, in the deer forest of Manore, where he had lost his way, in December, 1887. He did a great work in the London slums and his continual suits at law helped to clear up difficulties on ritual questions. Consult W. A. J. Archbold, in *Dictionary of National Biography*, vol. xxxv (London, 1893).

MACKUBIN, *ma*k-kŭb′ĭn, Florence (c.1860–). An American portrait and miniature painter. She was born in Florence, Italy, and studied under Deschamps and Rolshoven in Paris and Herterrich in Munich, also miniature painting under Mademoiselle Devina in Paris. After her return to the United States she made Baltimore her residence. She received a medal for miniatures at the Tennessee Exposition in 1897, and in 1900 was commissioned by the Governor of Maryland to make a copy of Van Dyck's portrait of Queen Henrietta Maria (Warwick Castle) for the Maryland State House. Her other portraits include Governors Lloyd, Winder, Ridgely, Swann, and Lowndes for the Maryland State House; professors Gildersleeve (University of Virginia) and Elliott (1912, Johns Hopkins University); and Francis Scott Key (1913). Among her delicately executed miniatures is one of Cardinal Gibbons. Her "Study in Yellow" is in the Walters collection, Baltimore.

McLACHLAN, măk-lȧK′*la*n, Alexander (1818–96). A Scottish-Canadian poet. He was born in Johnstone, Renfrewshire, Scotland, and went to Canada in 1840. His democratic disposition is shown by the vigorous radicalism of his verse—*The Spirit of Love, and Other Poems* (1846); *Poems, Chiefly in the Scottish Dialect* (1856); *Lyrics* (1858); *The Emigrant, and Other Poems* (1861); *Poems and Songs* (1874). In 1863 he was government emigration agent in Scotland, where he lectured, as well as in Canada and the United States. A complete edition of his poems, with a memoir, was published in 1890.

MACLA′GAN, William Dalrymple (1826–1910). An English prelate. He was born in Edinburgh and early served in the Indian army (1847–49). In 1857 he graduated B.A. at Peterhouse, Cambridge, of which he was made honorary fellow in 1891. Subsequently he was rector of Newington, then vicar of St. Mary Abbott's, Kensington, till 1878, when he was appointed Bishop of Lichfield. In 1891, on the death of Dr. Magee, Maclagan succeeded to the archbishopric of York. In 1899 and 1900 he sat as assessor with the Archbishop of Canterbury in a voluntary spiritual court for the hearing of cases involving important principles of ritual and the determination of the law and practice of the Church upon them. He also joined his brother primate in a learned and effective defense of Anglican orders at the time when they were declared invalid at Rome. In 1908, because of failing health, he resigned his archbishopric, thereby setting a precedent. He was especially gifted as a writer of hymns, both text and music.

McLANE, măk-lān′, Allan (1746–1829). An American soldier in the Revolutionary War. He entered the Continental army as a volunteer in 1775; became a lieutenant under Cæsar Rodney in the same year; distinguished himself at Long Island and White Plains; participated in the New Jersey campaign, and was promoted to a captaincy in 1777. "He was a rough rider and free-booter of the most gallant type, and his troops comprised men of like spirit." He commanded the American outposts about Philadelphia in 1777–78 and took part in the battle of Monmouth. The next year he was a major in Gen. Henry Lee's "legion" and assisted materially in the capture of both Stony Point and Paulus Hook. He remained in the army until the close of the war, and subsequently became a judge of the Delaware Court of Appeals, United States marshal for Delaware, and collector of the port of Wilmington. He was a man of gigantic stature and wonderful physical strength and was noted for his great personal bravery. Consult: Hezekiah Niles, *Principles and Acts of the Revolution* (Philadelphia, 1876); C. J. Stillé, *Major General Anthony Wayne and the Pennsylvania Line in the Continental Army* (ib., 1893); S. G. Fisher, *Struggle for American Independence* (2 vols., ib., 1908).

McLANE, James Woods (1839–1912). An American physician, born in New York City. He graduated in 1861 from Yale University, and in 1864 from the College of Physicians and Surgeons (Columbia), where he was lecturer and professor of materia medica (1867–72), adjunct professor and professor of obstetrics and diseases of children (1872–91), professor of gynecology (1882–85) and of obstetrics (1891–98), president (1889–91), and dean of the medical faculty (1891–1903). In 1905 he became president of Roosevelt Hospital, New York.

McLANE, Jean. See Johansen, Jean McLane.

McLANE, Louis (1786–1857). An American statesman, born in Smyrna, Del. He began his career as a midshipman in the navy, but later studied law and entered politics. From 1817 to 1827 he was a Representative in Congress, and strongly opposed slavery. He was a United States Senator from 1827 to 1829, when he was appointed Minister to England. While holding this post he carried on negotiations which resulted in the opening of British West India ports to American trade. He returned from England in 1831 in order to become Secretary of the Treasury in Jackson's cabinet, but in 1833 disapproved of Jackson's order to withdraw the deposits from the United States Bank, and was transferred to the State Department, where he remained one year. He retired from politics in 1834. From 1837 to 1847 he was president of the Baltimore and Ohio Railroad. In 1845 he was again made Minister to England, but resigned in 1846 after the settlement of the Oregon question. (See Oregon, *History.*) He was a delegate to the Maryland Constitutional Convention (1850–51). He died at Baltimore.

McLANE, Robert Milligan (1815–98). An American diplomatist, born in Delaware. He studied at St. Mary's College, Baltimore, and in France, and graduated at West Point in 1837. He resigned from the army in 1843 and practiced law in Baltimore. In 1845–46 he was in the Legislature of Maryland, and from 1847 to 1851 served in the United States House of Representatives. He was a Democratic presidential elector in 1853, and in the same year was appointed Commissioner to China, but retired in 1854. In 1859–60 he was Minister to Mexico. He was a States' rights candidate for Congress in 1861, but withdrew before the special election, and was a member of the committee appointed to consider the relations of Maryland with the Union. From 1879 to 1883 he was again a member of the United States House of Representatives. He was Governor of Maryland in 1884–85, but resigned to accept the post of Minister to France. From this position he retired in 1889, and he lived the remainder of his life in Paris.

MACLAREN, m*a*-klăr′*e*n, Ian, ē′ăn. The pseudonym of the Scottish writer John Watson (q.v.).

McLAREN, William Edward (1831–1905). An American Protestant Episcopal bishop. He was born in Geneva, N. Y.; graduated at Jefferson College in 1851; and was a tutor and newspaper man until 1857. He studied theology in the Presbyterian seminary at Pittsburgh and was ordained in 1860 and sent to Bogotá, South America, by the Board of Foreign Missions. He was afterward pastor of churches in Pittsburgh, in Peoria, Ill., and in Detroit. His views changed, and he was ordained priest in the Protestant Episcopal church in 1872, and became rector of Trinity Church, Cleveland, Ohio. In 1875 he was consecrated Bishop of Illinois, and when the diocese was divided he retained the northern portion, now known as the Diocese of Chicago. He founded the Western Theological Seminary at Chicago in 1883, and Waterman Hall for girls at Sycamore, Ill. His publications include: *Catholic Dogma the Antidote of Doubt* (1884); *Inner Proofs of God* (1884); *Analysis of Pantheism* (1885); *The Practice of the Interior Life* (1897); *The Holy Priest* (1899); *The Essence of Prayer* (1901).

McLAUGHLIN, măk-ląk′lĭn, Andrew Cunningham (1861–). An American historian, born at Beardstown, Ill. After graduating from the University of Michigan (A.B., 1882; LL.B., 1885), he taught there until 1906, after 1891 holding the chair of American history. From 1903 to 1905 he was director of the Bureau of Historical Research in the Carnegie Institution, Washington. After 1898 he was associate editor (in 1901–05 managing editor) of the *American Historical Review,* and in 1914 he served as president of the American Historical Association. He married a daughter of James B. Angell (q.v.). After 1906 he was head of the department of history and after 1908 head of the department of Church history in the University of Chicago. His works include: *Lewis Cass,* in the "American Statesmen Series" (1891); *History of Higher Education in Michigan* (1891); *Civil Government in Michigan* (1892); *A History of the American Nation* (1899; rev. ed., 1913); *The Confederation and the Constitution* (1905); *The Courts, the Constitution, and Parties* (1912); and he edited: *Cooley's Principles of Constitutional Law* (1898); *The Study of History in Schools* (1899); *Cyclopedia of American Government* (3 vols., 1914), with A. B. Hart.

McLAURIN, măk-lą′rĭn, Anselm Joseph (1848–1909). An American legislator, born at Brandon, Miss. At 16 he joined the Confederate army and served as a private throughout the Civil War. He then attended the Summerville Institute in 1865–67 and was admitted to the Mississippi bar in 1868. He was elected district attorney in 1871 and was a Democratic member of the State House of Representatives in 1879. In 1888 he served as a presidential elector, and in 1890 as a member of the State Constitutional Convention. He was elected to fill an unexpired term (1894–95) in the United States Senate and served as Governor of Mississippi in 1895–99. He was again United States Senator from 1901 until his death.

MACLAURIN, Colin (1698–1746). A Scottish mathematician, born at Kilmodan, in Argyllshire. While quite young he was left an orphan and was brought up by one of his uncles. He studied at the University of Glasgow and there his mathematical genius showed itself very early. At the age of 15 he took the degree of M.A., defending a thesis on the power of gravitation. When only 19 years old (1717) he obtained the professorship of mathematics in Marischal College, Aberdeen. In 1719 he visited London and made the acquaintance of Sir Isaac Newton and was made a member of the Royal Society. In 1722 he was engaged by Lord Polwarth to travel with his son and spent some time in France, and while there obtained the prize of the French Academy for a treatise on the percussion of bodies. In 1725 he succeeded James Gregory as professor of mathematics in the University of Edinburgh. There he also devoted his attention to physics, astronomy, and other sciences, and soon acquired a wide reputation and influence. In 1740 he divided with Bernoulli and Euler a prize given by the French Academy for a work on the tides. In 1745 he organized the defenses of Edinburgh against the Pretender, his efforts at this time seriously impairing his health. When the rebels obtained possession of Edinburgh he took refuge in England. He died in the following year. Next to Newton he was the greatest British mathematician of the eighteenth century. He developed the fluxional calculus, contributed extensively to the theory of attraction, and showed that a revolving homogeneous fluid assumes the form of an ellipsoid. This discovery is important for the light it throws on the theory of the tides and on the investigations in regard to the figure of the earth. He also contributed to pure geometry and the theory of equations. He invented the method of solving equations with equal roots by aid of the first derived equation. He is best known for an important theorem in calculus which bears his name. By means of this a function of one variable may be expanded in terms of ascending integral powers of the variable. His most important works are: *Geometria Organica* (1719); *A Treatise of Fluxions* (1742; 2d ed., 1801; French trans., 1749); *Treatise of Algebra* (1748; 5th ed., 1788; French trans., 1753); *De Linearum Geometricarum Proprietatibus* (1748); *An Account of Sir Isaac Newton's Philosophy* (1748; 3d ed., 1775). Consult Murdoch in the preface to the last-named work and Charles Platts, in *Dictionary of National Biography,* vol. xxxv (London, 1893).

MACLAURIN, Richard Cockburn (1870–1920). An American educator. Born at Lindean, Scotland, he gained his early education at the grammar school of Auckland, New Zealand; graduated M.A. from the University of Cambridge in 1897; and studied at Lincoln's Inn, London. He was professor of mathematics (1898–1905) and dean of the faculty of law (1905–07) at New Zealand University; held the chair of mathematical physics at Columbia University, New York, in 1907–09; and thereafter was president of Massachusetts Institute of Technology. For the changes which occurred during his administration, see the article on the Institute. He received honorary degrees from Cambridge, Harvard, Wesleyan, and Dartmouth. He is author of *Title to Realty* (1900); *The Theory of Light* (1908); *Lectures on Light* (1909); *The Outlook for Research* (1911).

McLAWS, măk-lạz′, Lafayette (1821–97). An American Confederate soldier, born in Augusta, Ga. He graduated in 1842 at the United States Military Academy and served in the Mexican War. In May, 1861, he entered the Confederate army as a major and a month later he was promoted to the rank of colonel and put in command of the Tenth Georgia Regiment. In September of the same year he was advanced to brigadier general and in May, 1862, to major general. He led his division with great skill and courage at Savage Station and Malvern Hill, at Harper's Ferry and Maryland Heights, while his timely arrival and prompt action on the field at Sharpsburg repulsed the Federals on the Confederate left. In the battle of Chancellorsville he drove back Sedgwick, who was advancing on Lee's rear, and in the second day at Gettysburg his division beat off Sickles's command. He offered what opposition he could in Georgia to Sherman's march to the sea. His command was included in General Johnston's surrender. In 1875 he was appointed collector of internal revenue at Savannah, and in 1876 postmaster of the same city.

MACLAY, mȧ-klī′. See Miklucho-Maclay, Nikolai.

MACLAY′, Robert Samuel (1824–1907). An American Methodist Episcopal clergyman and missionary, born at Concord, Franklin Co., Pa. He graduated from Dickinson College in 1845 and entered the ministry in the same year. In 1847 he went as a missionary to Foochow, China, sailing in October and reaching his destination the following April. There he remained until 1873, when he was detailed to establish the first Methodist Episcopal church in Japan. He was president of the Ei Wa Gakko (Methodist College) in Tokyo from 1883 to 1888, and from then until his death served as dean of the Maclay School of Theology at the University of Southern California, Los Angeles. He was a member of the Ecumenical Conference of 1881 and of the General Conferences of 1872 and 1888; translated and assisted in the translation of the Scriptures and of many other works into the Chinese and Japanese languages; and was the author of *Life among the Chinese* (1861), *A Dictionary of the Chinese Language in the Dialect of Foochow* (1871), with C. C. Baldwin, and *A Treatise on Homiletics* (1890).

MACLAY, William (1737–1804). An American patriot and politician. He was born at New Garden, Chester Co., Pa., of Scotch-Irish parentage, and was educated at an academy there. In the French and Indian War he served as a lieutenant in the expedition of Gen. John Forbes against Fort Duquesne in 1758 and later served under General Bouquet. He afterward studied law and was admitted to the bar, after which he went to England to consult with the proprietors of Pennsylvania regarding land grants to militia officers who had served in the French War. After returning to America he became attorney for the Penn family in Pennsylvania. He nevertheless actively interested himself in the Revolutionary movement, took a leading part in raising and equipping Pennsylvania troops, acted as assistant commissary of purchase, and saw some active service in the field. He was elected to the Pennsylvania Assembly in 1781, served on the State Executive Council and as a judge of the Common Pleas, and in January, 1789, was elected with Robert Morris (q.v.) one of the first representatives of Pennsylvania in the United States Senate. He served only until 1791, but during that period attracted attention by his violent hostility to Washington, to whose presence in the Senate Chamber he objected, and to the Federalist administration and policy generally. He served in the Pennsylvania Legislature in 1795 and was a county judge from 1801 to 1803. His *Journal* (edited by Edgar Stanton Maclay and published in 1890) contains a valuable and interesting account of the first national Congress.

MACLE, măk″l (OF. *macle, mascle*, Fr. *macle*, It. *macula*, from Lat. *macula*, spot, stain). A variety of andalusite, the crystals of which have the axis and angles of a different color than the remainder of the mineral, exhibiting in transverse section a tessellated appearance or a cross, which is due to a regular arrangement of the carbonaceous impurities through the interior. This mineral is also called cross stone and has been used for making beads for rosaries. The term "macle" is also sometimes used in mineralogy to designate twin crystals. See Mineralogy.

MacLEAN, măk-lān′, George Edwin (1850–). An American educator, born at Rockville, Conn. He graduated in 1871 at Williams College, studied theology (Yale, B.D., 1874), and held pastorates at New Lebanon, N. Y. (1874–77), and Troy, N. Y. (1877–81). After study at the universities of Berlin and Oxford (1882) and Leipzig (Ph.D., 1883), he was appointed professor of English language and literature in the University of Minnesota. In 1895 he became chancellor of the University of Nebraska and from 1899 to 1911 was president of the State University of Iowa. In 1913, as a specialist for the United States Bureau of Education, he made a study of the English universities. He published: *An Introductory Course in Old English* (1891); *An Old and Middle English Reader* (1893); *A Decade of Development in American*

State Universities (1898); *Present Standards of Higher Education in the United States* (1913).

McLEAN, George Payne (1857–). An American lawyer and legislator, born at Simsbury, Conn. He graduated in 1877 from the Hartford High School. While engaged as a reporter on the Hartford *Evening Post* he studied law, and after his admission to the bar in 1881 he practiced in Hartford. He served as a Republican member of the lower house of the Connecticut General Assembly in 1883, was clerk of the Board of Pardons (established largely as a result of his efforts) from 1884 to 1901, in 1886 was a member of the State Senate, and in 1892–96 was United States attorney for Connecticut. During his term as Governor of Connecticut (1901–03) he was instrumental in calling the Constitutional Convention of 1902 and in establishing a tax commission. McLean was elected to the United States Senate in 1910.

MacLEAN, James Alexander (1868–). A Canadian educator. He was born at Mayfair, Ontario, and was educated at Toronto and Columbia universities. He was professor of political science in the University of Colorado (1894–1900), president of the University of Idaho for 13 years, and in 1913 became the first president of the University of Manitoba. He was a member of the Council of the American Economic Association (1894–1900) and published several essays on Canadian financial history (1894).

McLEAN, John (1785–1861). An American political leader and jurist, born in Morris Co., N. J. His father removed in 1789 to Virginia, then to Kentucky (1790), and finally settled in Warren Co., Ohio (1797). Young McLean began the study of law in Cincinnati in 1803 and was admitted to the bar in 1807. In 1812 he was elected to the National Congress as a Democrat and served until 1816, when he resigned upon being elected State Supreme Court judge. This position he held until his appointment in 1822 as Commissioner of the Land Office. In 1823 he was appointed Postmaster-General. He was continued in office by President John Quincy Adams and worked such great improvement that Congress increased the salary of the office. He disagreed with President Jackson on the question of patronage and resigned from the cabinet, though offered both War and Navy departments. President Jackson, however, appointed him to the Supreme Court of the United States in 1829. He wrote a dissenting opinion in the Dred Scott case, declaring that slavery exists by force and "is limited to the range of the laws under which it is sanctioned." In 1848 he was a candidate for the presidential nomination of the Free Soil party and in 1856 received 196 votes at the Republican convention. He published *Reports of the United States Circuit Courts* (1829, 1840–56) and *Eulogy on James Monroe* (1831).

McLEAN, John (1800–86). An American educator, tenth president of Princeton College. He was born in Princeton, where his father was professor of chemistry in the college, and lived there during his whole life. He graduated in 1816 and two years later became a tutor. From that time until his resignation of the presidency, which he held from 1854 till 1868, he was a member of the faculty. Among Dr. McLean's publications are: *A Lecture on a Common School System for New Jersey* (1829), which had considerable influence with the Legislature when it later established a common-school system; two letters on *The True Relations of the Church and the State to Schools and Colleges* (1853); and a *History of the College of New Jersey* (1877).

MACLEAN, John (1851–). A Canadian Methodist clergyman and author. He was born at Kilmarnock, Scotland, and was educated first at Dumbarton and later, after coming to Canada, at Victoria University, Cobourg. He also studied at Illinois Wesleyan. Ordained in 1880, he served as a missionary to the Blood Indians, Alberta (1880–89), and afterward filled several pastorates in the Canadian northwest. He edited the *Wesleyan* (1902–06) and attained several important offices in his denomination. Maclean, who became an authority on the languages and customs of Indian tribes in the Canadian Northwest, was correspondent of the British Association on Northwest Indian Tribes from 1882 to 1888. In the latter year he was appointed a member of the Northwest Board of Education, and he became a member of several learned societies. His publications include: *Lone Land Lights* (1890); *James Evans, Inventor of the Syllabic System of the Cree Language* (1890); *The Indians of Canada* (1892); *Canadian Savage Folk* (1896); *Language and Religion* (1899); *Life among the Ojibwa and Cree Indians* (1903); *Life of William Black* (1907); *Winning the Front Place* (1908).

McLEAN, Norman (1865–). A British Orientalist. He was born in Lanark and was educated at Edinburgh University and at Christ's College, Cambridge, of which he became fellow, tutor, and Hebrew lecturer. He was also University lecturer in Aramaic. McLean carried on Professor William Wright's work in editing with Merx (1896) the *Ecclesiastical History* of Eusebius in Syriac, and with A. E. Brooke he began in 1906 the publication of a larger Cambridge edition of the Septuagint.

McLEAN, Sarah Pratt (Mrs. Greene) (1858–). An American author, born at Simsbury, Conn., and educated at Mount Holyoke. She married Franklin Lynde Greene in 1887. Her first book, *Cape Cod Folks* (1881), describing, it was said, persons she had known, involved her in a libel suit. Her other work includes: *Some Other Folks* (1882); *Towhead* (1883); *Lastchance Junction* (1889); *Leon Pontifex* (1890); the popular *Vesty of the Basins* (1892; new ed., 1912); *Stuart and Bamboo* (1897); *The Moral Imbeciles* (1898); *Deacon Lysander* (1904); *Power Lot* (1906); *The Long Green Road* (1911); *Everbreeze* (1913).

MACLEAN, William Findlay (1854–). A Canadian journalist and legislator. He was born at Ancaster, Ontario, graduated at Toronto University, and began newspaper work as a reporter on the Toronto *Daily Globe*. In 1880 he became editor in chief of the Toronto *World*, an Independent Conservative journal, the first newspaper in Canada to be published at the price of one cent. From 1892 to 1904 he was a Conservative member of the House of Commons. His independence, both in journalism and politics, made him an uncertain though salutary factor in public life; and after 1904, when he was reëlected, his party ceased to recognize him as a regular adherent. In defiance of the tradition of the Scottish Presbyterian Sabbath Maclean established a Sunday issue of his newspaper, the first of its kind in Canada; and his unyielding insistence upon certain measures (government railway ownership, two-cent passenger rate, etc.) framed from a national instead of a party point of view, familiarized many voters with a political outlook which was worth while as a change of mental habit. His Canadian National Platform, issued in 1903, did not win strong support, but failed in detail rather than in its appeal to independent thinking. Maclean became a member of the Public Ownership League, a promoter of the Canadian Associated Press, and was a delegate to the Imperial Press Conference, London (1909).

MACLEAR′, GEORGE FREDERICK (1833–1902). A Church of England scholar. He was born in Bedford; graduated at Cambridge (B.A.), 1855; became headmaster of King's College school, London, 1866, warden of St. Augustine's College, Canterbury, 1880. In 1885 he was made an honorary canon of Canterbury. His publications include: *Introduction to the Prayer Book* (1869); *Apostles of Mediæval Europe* (1869); *The Gradual Conversion of Europe* (1875); *The Conversion of the Celts, the English, the Northmen, and the Slavs* (1878–79); *The Evidential Value of the Holy Eucharist* (Boyle Lectures, 1879–80); *St. Augustine's, Canterbury: Its Rise, Ruin and Restoration* (1888); *Introduction to the Creeds* (4th ed., 1899); and, with W. W. Williams, *Introduction to the Articles* (2d ed., 1896). He edited the Oxford Bible helps (1893), and the Gospel of Mark in the *Cambridge Bible for Schools and Colleges* (1893).

MACLEHOSE, mak″l-hōz, MRS. AGNES (1759–1841). A sweetheart of Robert Burns, born in April, 1759. She was a daughter of Andrew Craig, a surgeon of Glasgow. Robert Chambers afterward described her as of "a somewhat voluptuous style of beauty, of lively and easy manners, of a poetical fabric of mind, with some wit, and not too high a degree of refinement and delicacy." In 1776, after a brief courtship, she married James Maclehose, Glasgow lawyer. Owing to the husband's jealousy, they separated four years later. Mrs. Maclehose lived first at Glasgow and then at Edinburgh, where she was supported in part by Lord Craig. Her husband sailed for Jamaica. Burns first met Mrs. Maclehose at Edinburgh, Dec. 7, 1787, and a mutual attraction soon grew up. A correspondence ensued in which they addressed each other as Clarinda and Sylvander. So far as their letters (published without Mrs. Macklehose's knowledge in 1802) are concerned, their relations had merely an ambiguous aspect; but Professor Nicoll in his edition of Burns (see below) is certain "it was no case of mere philandering." Their last meeting, which took place on Dec. 6, 1791, Burns immortalized in "Ae fond kiss, and then we sever," and in three other lyrics. During the friendship Mrs. Maclehose wrote several little poems, one of which Burns thought worthy of Sappho. She joined her husband in Jamaica, was coldly received, and then returned to Edinburgh, where she died Oct. 22, 1841. The correspondence is published in the works of Burns. Consult the life by W. C. Macklehose prefixed to the *Correspondence*, and the introduction by Professor Nicoll prefixed to the Library Edition of Burns (1877).

McLEL′LAN, JAMES ALEXANDER (1832–1902). A Canadian educator. He was born at Shubenacadie, Nova Scotia. After teaching school for several years in his native province he removed to Toronto in 1857, attended the Provincial Normal School there, and graduated at Toronto University, afterward taking a law course in that institution. He was appointed headmaster of Yarmouth Seminary (1864), a mathematical instructor in Upper Canada College (1869), high-school inspector for Ontario (1871), director of normal schools (1875), and director of teachers' institutes (1885). In 1890 he became principal of the School of Pedagogy, later named the Ontario Normal College, holding also the chair of psychology and the history of education. McLellan improved the high schools of Ontario and the methods of elementary mathematical teaching and did much to establish a higher standard of training for teachers. When in Nova Scotia (1864–69) he worked to promote confederation and in 1872 was an unsuccessful Liberal candidate for the House of Commons. He published several textbooks on arithmetic and algebra and also *Applied Psychology* (1889), and, with John Dewey, *The Psychology of Number* (1895).

McLEN′NAN, JOHN CUNNINGHAM (1867–). A Canadian physicist, born at Ingersoll, Ontario, and educated at Toronto and Cambridge universities. He was appointed assistant demonstrator in physics in Toronto University (1892), and in the same department he afterward became demonstrator (1899), associate professor (1902), and, in 1907, professor and director of the physical laboratory. He was elected a fellow of the Royal Society of Canada, was appointed by the Dominion government to lecture throughout Canada on the metric system, became a councilor of the Canadian Institute (1907) and honorary president of the mathematical and physical section of the Ontario Educational Association (1908), and in 1910 served as president of the mathematical and physical section of the Royal Society of Canada. In recognition of his research work in physics he was elected a fellow of the Royal Society, London, England, in 1915. He contributed frequently to scientific periodicals.

McLENNAN, JOHN FERGUSON (1827–81). An English sociologist, best known for his theory of exogamy. He was born at Inverness and was educated there, at King's College, Aberdeen, where he graduated M.A. in 1849, and at Trinity College, Cambridge. His study of the custom of marriage by capture resulted in *An Inquiry into the Origin of the Form of Capture in Marriage Ceremonies* (1865), in various articles in the *Fortnightly*, *Argosy*, and other reviews, and in *Studies in Ancient History* (1876). In 1880 he began a study of Maine's theory of the patriarchate. Uncompleted at his death, it was edited in 1885 by Donald McLennan with the title *The Patriarchal Theory*. McLennan was also a pioneer in the study of totemism and wrote much on that subject. He published, besides, a *Memoir of Thomas Drummond* (1867).

MACLEOD, măk-loud′. A town and the capital of Macleod District, Alberta, Canada, situated at the junction of the Crow's Nest Pass and the Calgary and Macleod branches of the Canadian Pacific Railway, 102 miles south-southeast of Calgary (Map: Alberta, G 9). It is a post of the Royal Northwest Mounted Police. Its manufactures include cement, iron goods, and flour, and it has a large filtration plant, four grain elevators, and a grain warehouse. In the vicinity are extensive deposits of bituminous and anthracite coal. Building stone, brick clay, cement rock, and natural gas are found. Pop., 1901, 796; 1911, 1844; 1914 (local est.), 2510.

McLEOD, Alexander (1774–1833). An American Presbyterian minister. He was born in the island of Mull, came to America in 1792, and graduated at Union College in 1798. The next year he was licensed to preach; he became pastor of the First Reformed Presbyterian Church of New York and remained there till his death. He published: *Negro Slavery Unjustifiable* (1802); *The Messiah* (1803); *Lectures on the Principal Prophecies of the Revelation* (1814); *View of the Late War* (1815); *The American Christian Expositor* (1832–33); and was one of the editors of the *Christian Magazine.* For his life, consult Wylie (New York, 1855).

McLEOD, Archibald Angus (1848–1902). An American railroad manager and president, born in Compton Co., Quebec. He came to the United States while a boy, and after attempting unsuccessfully to run a pottery in Texas became a rodman on the Duluth docks of the Northern Pacific Railroad. Here he became acquainted with Austin Corbin, who made him manager of the Elmira, Cortland, and Northern Railroad in 1885, and in 1886 acting general manager of the Reading system. In January, 1887, he was named vice president and general manager and in 1890 was elected to the board of managers, later becoming Corbin's successor as president. He immediately planned a great combination of coal-carrying interests with the Lehigh Valley and the Jersey Central under Reading control, and an all-rail route to New England. But a year after the consolidation the Reading passed into a receivership, and McLeod resigned from the presidency to become one of three receivers. The failure of the scheme was due possibly to the opposition of the Morgan interests as well as to the accumulation of a tremendous floating debt.

MacLEOD, Donald (1831–1916). A Scottish divine and author, brother of Norman MacLeod, born at Campsie, Stirlingshire. After graduating from the University of Glasgow and traveling for ten years, he settled as minister, first at Lauder (1858), then at Linlithgow (1862), and for many years after 1869 served the parish of the Park, Glasgow. In 1895–96 he was moderator of the Assembly of the Church of Scotland, and he was chaplain to three sovereigns, Queen Victoria, Edward VII, and George V. In 1872 he succeeded his brother as editor of *Good Words,* a popular religious periodical, and remained in the editorial chair until 1905. Besides memoirs of his father and his brother, his books include *Sunday Home Service* (1885), *Christ and Modern Society* (1893), and several other devotional and theological works.

MACLEOD, Fiona. The pseudonym of the English poet and essayist, William Sharp (q.v.), under which were written many poems, stories, and sketches, mainly on subjects connected with Celtic literature and mythology. The fact that Fiona Macleod was a pseudonym was not known until after Sharp's death.

MACLEOD, Henry Dunning (1821–1902). A British financier and economist. He was born in Edinburgh, was educated at Eton and at Cambridge, where he graduated B.A. in 1843, was called to the bar in 1849, and attained considerable distinction as an authority on economic and financial subjects, attracting attention particularly by his work in connection with the theory of credit. He was also active as a law reformer and codifier, originated many of the changes and improvements in the poor laws of Scotland, and between 1868 and 1870 was employed by the British government in codifying the law of bills of exchange. He lectured on banking at Cambridge, at King's College, London, and at Edinburgh and Aberdeen. His publications include: *Theory and Practice of Banking* (1856; 5th ed., 1892–93; It. trans.); *Elements of Political Economy* (1858; reissued in 1872–75 as *The Principles of Economical Philosophy* and in 1881–86 as *The Elements of Economics*); a *Dictionary of Political Economy* (1859); *Elements of Banking* (1876); *Economics for Beginners* (1883); *The Theory of Credit* (2 vols., 1889–91; 1 vol., 1898); *Bimetalism* (1894); *History of Banking in Great Britain* (1896); *Indian Currency* (1898).

McLEOD, Hugh (1814–62). An American soldier, born in New York City. He graduated at West Point in 1835, but in the same year resigned his commission and joined the Texan army arrayed against the Mexican government. In 1841 Mirabeau B. Lamar, then President of Texas, put McLeod in command of the expedition organized to establish trade relations between Texas and New Mexico, but he was treacherously taken prisoner by the Mexicans, and was held until a year later, when the United States government protested against his detention. Subsequently he was active in politics, served in the Texas Congress in 1842–43 and in the Mexican War, and was a member of the Texas Legislature after the annexation. When the Civil War began, he commanded a Texas regiment in the first Virginia campaign.

McLEOD, John (1788–1849). A Canadian explorer, born at Stornoway in the island of Lewis, Scotland. In 1811 he came to America and entered the service of the Hudson's Bay Company. He took an active part in the settlement at Selkirk and Winnipeg and afterward opened trade routes to the Pacific. For several years he cultivated a large farm, with grist and saw mills, at Vancouver. In 1826 he returned to the Hudson Bay district, where he was placed in charge of the company's work in North America. He died in Montreal, July 24, 1849.

McLEOD, Malcolm (1821–98). A Canadian lawyer and author, a son of John McLeod (q.v.) the explorer. He was born at Green Lake, Saskatchewan, then a part of the Northwest Territories, Oct. 21, 1821. He was sent to Edinburgh, Scotland, for his education, and after studying law in Montreal he was admitted to the bar in 1845. He became district magistrate for the counties of Ottawa and Pontiac (1874–76) and queen's counsel (1887). His name is especially known for his important public services in the great Northwest. His exposure of the abuses of the Hudson's Bay Company hastened the surrender of its charter and the incorporation of its territories with the Dominion of Canada (1870). He also published *The Peace River* (1872), made up from his father's journal and his own observations in the Northwest; *Problems of Canada* (1880); and numerous valuable papers on the geography and history of Canada. He died at Ottawa in September, 1898.

MacLEOD, Norman (1812–72). A Scottish divine and author, brother of Donald MacLeod, born at Campbelltown, Argyllshire, where his father was minister. He was educated at the University of Glasgow, studied divinity at Edinburgh, and was ordained minister of the Church of Scotland. In the controversy which soon divided the church he adopted a middle course between the evangelicals and the moderates, producing several able pamphlets. On the disruption he remained in the church. He was one of the founders of the Evangelical Alliance (1847). In 1852 he accepted the Barony Parish in Glasgow, where he established the first congregational penny savings bank and opened refreshment rooms for workingmen and a mission church for the poor. In 1857 he was appointed chaplain to the Queen. He edited the *Christian Magazine* from 1850 to 1860 and was the first editor of *Good Words* (1860–72). After a visit to Egypt and Palestine in 1864, he published *Eastward* (1866). In 1867 he was sent by the General Assembly to inspect the missions in India. An account of this tour was published under the title *Peeps at the Far East* (1871). Consult *Memoirs*, by his brother, Donald MacLeod (New York, 1876).

MACLISE, mȧ-klēs′, Daniel (c.1806–70). An Irish historical painter. He was born in Cork, probably in 1806. He first studied at the Cork Academy and in 1827 entered the schools of the Royal Academy, winning the gold medal in 1829 for his historical painting "The Choice of Hercules." In 1830–38 appeared his well-known character sketches in *Fraser's Magazine*, in which he displayed great technical skill. He was successful in portrait painting, but gave it up in 1833, after the success of his two pictures, "Snap-Apple Night" and "Mokanna Unveiling his Features to Zelica." He became Royal Academician in 1840. In 1859 Maclise went to Berlin to study stereochrome, to prepare for the two stereochrome paintings for Westminster Palace, the "Meeting of Wellington and Blücher at Waterloo," 46 feet long, and the "Death of Nelson," which engrossed much of his later years. He died at Chelsea, April 25, 1870.

The most important works of Maclise are his mural paintings. He was a good draftsman, and his conceptions are forceful, but his method is dry and conventional, his color is crude, and his pictures are deficient in atmosphere. His frescoes include: "The Spirit of Justice" and "Spirit of Chivalry" (1850), House of Lords; "Marriage of Strongbow and Eva" (1854) and "Alfred in the Danish Camp," Royal Gallery, Parliament House; "Comus," pavilion of Buckingham Palace. His easel pictures in the Tate Gallery, London, are "Play-Scene in Hamlet" (1842) and "Malvolio and the Countess" (1840). A portrait of Dickens (1839) is in the National Portrait Gallery, London. Among his book illustrations are those for Moore's *Irish Melodies*, Lytton's *Pilgrims of the Rhine*, Bürger's *Leonore*, and a series of designs for the *Story of Norman Conquest*. Consult O'Driscoll, *Memoir of Daniel Maclise* (London, 1871).

McLOUGHLIN, mak-lŏk′lĭn, John (1784–1857). A Canadian explorer and fur trader, chief founder of Oregon. He was born at Rivière du Loup, Lower Canada, and in his youth went to Scotland and studied medicine in Edinburgh. A life of adventure appealed to him, and he came to Canada to engage in the fur trade. He joined the Northwest Company, a strong rival of the Hudson's Bay Company. Rising rapidly in the confidence of his employers, he was put in charge of the trading post at Fort William in 1821, when the rival companies were amalgamated under the name of the Hudson's Bay Company. He was appointed to take charge of the Columbia River department in 1823, built Fort Vancouver, Oregon, in 1824, and made it the headquarters of the company for the whole territory west of the Rocky Mountains. Mainly under his direction the company won control of the fur trade on the Pacific coast. McLoughlin organized new trading posts, sent expeditions to the Fraser River by sea, also to the Sacramento and San Joaquin valleys, and built Forts Colville, Langley, Simpson, and McLoughlin. His associate, later known as Sir James Douglas (q.v.), left him on account of their differences over the Oregon boundary, and after the tide of immigration had begun to flow into Oregon Territory, making their further coöperation impossible. (See Oregon, *History.*) McLoughlin recognized the agricultural possibilities of Oregon and founded the Puget Sound Agricultural Company. He resigned from the Hudson's Bay Company in 1846, removed to Oregon City, and became an American citizen. In 1907 a memorial educational institution bearing McLoughlin's name was dedicated in that city. Consult: Eva E. Dye, *McLoughlin and Old Oregon* (Chicago, 1900); F. V. Holman, *Dr. John McLoughlin, the Father of Oregon* (Cleveland, 1907); Agnes Laut, *Conquest of the Great North-West* (New York, 1911).

McLOUGHLIN, Maurice Evans (1890–). An American tennis champion, born at Carson City, Nev. He learned to play on the asphalt courts of San Francisco. He early became champion on the Pacific coast, then played in the East in 1908–09, and in the latter year, with Melville Long, he went to Australia to compete for the Davis cup. They were defeated by Brookes and Wilding. With Larned and Wright he made another trip for the cup in 1911, but they lost to Brookes and Dunlop. In 1912 McLoughlin won the Western event, then the Longwood, the New York State, and finally the national tennis championship at Newport; and in 1913 he held first place on the American team that won the Davis cup from England. In 1914 he won the Longwood event and the New York State championship and retained the national championship in doubles with Bundy. Although the Davis cup was won by Australia in the latter year, McLoughlin's defeat of both Brookes and Wilding in the singles easily made him world champion. His game is primarily one of attack.

McLOUTH, mak-louth′, Lawrence Amos (1863–). An American Germanic scholar, born at Ontonagon, Mich. He graduated in 1887 from the University of Michigan, to which, after three years as principal of the Danville (Ill.) High School and two years of study at Leipzig, Heidelberg, and Munich, he returned as instructor in German. In 1895 he became professor of Germanic languages and literatures at New York University. He contributed literary, philological, and pedagogical articles to periodicals; translated and edited Zwingli's sermons (1902) and some of the novels of Gerstäcker (1904) and Heyse (1910); published *The Teaching of Foreign Literature* (1903) and *Verses* (1910); and had charge of the department of German literature in the second edition of the New International Encyclopædia (1913–16).

MACLURE, m'-klōōr′, William (1763–1840). An American geologist. Born in Scotland, at 19 he emigrated to the United States. Later, having returned to London, he made a large fortune as a merchant. After 1796 he lived mostly in America. In 1803 he was sent abroad by the government as a commissioner to settle the French spoliation claims. During this visit to the Continent he studied geology, making large collections of specimens. His *Observations on the Geology of the United States*, read before the American Philosophical Society in 1809, and a second discussion, read in 1817, contain the results of his researches in nearly every State of the Union. In the course of his work he crossed the Alleghanies 50 times. With his paper of 1817 he presented the first geological map of the United States. After 1819 he was for several years interested in schemes to establish an agricultural school, first in Spain and then at New Harmony, Ind. Both attempts failed. In 1827 and again in 1828 he went to Mexico. It was there that he died. His library, collections of maps and charts, and $20,000 for a building, were bequeathed to the Philadelphia Academy of Natural Sciences, of which he had become president in 1817.

MACLUREA. See MACLURITES.

MACLURITES, măk′lụ-rī′tēz (*Maclurea anc.*) (Neo-Lat., named in honor of William Maclure). A large flattened gastropod shell, which is a common and characteristic fossil of the Lower Ordovician formations of North America and Great Britain. The shell, which coils to the left, has a depressed spire, the apex of which is sunken below the angular keels of the outer whorls, and its lower surface is almost flat. The aperture was closed by a large thick operculum of peculiar form, and these opercula are often found scattered through the rocks. These shells are very abundant in the Chazy limestone of the Champlain and St. Lawrence valleys, and their spiral cross sections may be seen on the surfaces of black marble slabs quarried in those regions and used in the floors of many public buildings in the Eastern States. See ORDOVICIAN SYSTEM.

McMAHON, mak-mä′on, SIR ARTHUR HENRY (1862–). A British soldier and administrator. After studying at the Royal Military College at Sandhurst, he joined the King's Regiment in 1883. He entered the Indian Staff Corps and in 1885 served with the Punjab frontier force. Joining the Indian Political Department in 1890, he was subsequently political agent in various parts of northwestern India and accompanied several expeditions and missions as political officer. As British commissioner, he determined the boundary between Baluchistan and Afghanistan (1894–96); he served as revenue and judicial commissioner for Baluchistan (1901–02), arbitrated the boundary between Afghanistan and Persia (1903–05), was agent to the Governor-General and Chief Commissioner to Baluchistan (1905–11), and became Foreign Secretary to the government of India in 1911. He presided over the Tibetan Conference in 1913, and when Great Britain declared a protectorate over Egypt in 1914 was made High Commissioner there. He was knighted in 1906.

McMAHON, JAMES (1856–). An American mathematician, born in County Armagh, Ireland. He was educated at the University of Dublin (A.B., 1881; A.M., 1890). At Cornell University he was examiner in mathematics (1883–84), instructor (1884–90), assistant professor (1890–1904), and professor after 1904. He served as an associate editor of the *Annals of Mathematics* in 1891–97 and collaborated on *Higher Mathematics* (1896), *Cornell Mathematical Series* (1898), *Plane Geometry* (1903).

MACMAHON, mȧk′mȧ′ôɴ′, MARIE EDME PATRICE MAURICE DE, DUKE OF MAGENTA (1808–93). A marshal of France and second President of the Third Republic. He was born at Sully in the Department of Saône-et-Loire, June 13, 1808, of Irish ancestry. He graduated at the military school of Saint-Cyr in 1827 and was attached to the general staff of the army. He was in the campaign of Algiers in 1830 and at the siege of the citadel of Antwerp in 1832. Returning to Africa, he made the long campaigns from the storming of Constantine in 1837 to the battle of Biskra in 1853, and for his brilliant services was rapidly advanced, becoming in 1852 a general of division and Commander of the Legion of Honor. In 1855 he was sent to the Crimea, and in the operations against Sebastopol led the successful assault on the Malakoff (September 8). On returning to France he received the Grand Cross of the Legion of Honor and was made Senator. In 1857 he served against the Kabyles and in the following year was made commander in chief of the French forces in Algeria. In 1859, on the breaking out of the war with Austria, MacMahon was put in command of the Second Corps, and on June 4 at Magenta he turned an impending defeat, due to Napoleon's inefficiency, into a great victory. For this achievement he was made a marshal of France and Duke of Magenta. At the battle of Solferino, June 24, 1859, he again had a great share in the victory. In September, 1864, he was once more Governor-General of Algeria. Upon the outbreak of the war with Germany he was placed at the head of the First Army Corps (July, 1870). On August 4 his vanguard was defeated at Weissenburg, and two days later he sustained a crushing defeat at Wörth. He retreated to Châlons and, placed at the head of a newly organized force of 120,000 men, was ordered to march to the relief of Bazaine (q.v.). In this enterprise MacMahon displayed little of his former resolution and dash. His slow advance permitted the Germans to interpose themselves between him and Bazaine, and at Sedan he found himself surrounded by the enemy. (See FRANCO-GERMAN WAR.) This resulted in another crushing defeat for the French (September 1). MacMahon, who was wounded early in the engagement, was compelled to relinquish the command. On the following day the army was obliged to surrender, together with the Emperor.

In March, 1871, after the preliminaries of peace, Thiers called MacMahon to the command of the Army of Versailles, to recover Paris from the Commune. This he accomplished towards the close of May, after a bloody struggle. (Consult his printed report, *L'Armée de Versailles depuis sa formation jusqu'à la complête pacification de Paris.*) After the establishment of peace MacMahon gave his hearty support to the Thiers government, and after Thiers's resignation in May, 1873, MacMahon was elected President of France by the support of the monarchical and clerical parties, who hoped to use him as a tool for the overthrow of the Republic. On Nov. 19, 1873, his term of office was extended to 1880, this so-called Septennate being aimed at delaying the permanent establishment of the Republic. Nevertheless the Republicans, under the leadership of Thiers and Gambetta, triumphed, and in 1875 the permanent organization of a republican form of government was effected. Charged with favoring Imperialists and seeking to continue in power, MacMahon declared that he should lend his aid to no scheme of monarchical restoration. The conflict with the Republicans continuing, the Chambers were dissolved, and both parties went to the country on the issue of the maintenance of the personal authority of the President, whose platform was "defense of the constitution and conservatism." In 1876 MacMahon was compelled to place Jules Simon (q.v.), whose liberal policy was more in accord with the sentiment of the majority in the Chambers, at the head of the ministry. The obstinacy of the Comte de Chambord frustrated the restoration of the monarchy, whereupon MacMahon strengthened his own executive position. He dismissed Simon under the influence of his reactionary advisers and tried to get an antirepublican majority through the manipulation of the elections by the cabinet of the Duc de Broglie. The action of MacMahon destroyed his popularity with the masses of the people, he was assailed by the press, and the preponderating state of opinion was expressed by Gambetta in his celebrated epigram, "Il faudra se soumettre ou se démettre" (Give in or get out). In the new Chamber the Republicans, despite all attempts to influence the elections, had a majority of 120, and a deadlock ensued between the ministry and the representatives. There were not wanting those among MacMahon's advisers who urged a coup d'état and the establishment of a dictatorship, and MacMahon considered the possibility of such a step by organizing a ministry under General Rochebouet, but the Republican majority refused to vote supplies until he accepted a Republican ministry. In a message to the Chambers (December, 1877) he acknowledged that the sentiment of the country was in favor of the Republic, pledged himself to rule in accordance with the will of the representatives, and thereafter took little active share in the government. He resigned the presidency on Jan. 30, 1879. He died at his estate of La Forest near Montargis, Oct. 17, 1893. He had a winning personality. He was a brave soldier without strategical talent and a patriotic statesman without political insight.

Bibliography. Stoffel, *La dépêche du 20 Août 1870 du maréchal Bazaine au maréchal de MacMahon* (Paris, 1874); E. Daudet, *Souvenirs de la présidence du maréchal de MacMahon* (ib., 1880); id., *Le maréchal de MacMahon* (ib., 1883); the biographies by Leonce Grandin (ib., 1893), Hennet (ib., 1894), Montbrillant (Lisle, 1894); and for an exhaustive biography, L. Lafarge, *Histoire complète de MacMahon, maréchal de France, duc de Magenta* (2 vols., ib., 1898).

MacMANUS, mak-măn′ŭs, SEUMAS (1868–). An Irish novelist and short-story writer, born at Mountcharles and educated at a mountain school in County Donegal. He became a schoolmaster and early began contributing verse and prose to periodicals. After 1899, when he first visited the United States, he was a frequent contributor to American magazines and papers. A fund of native drollery, an easy mastery of racy Irish idiom, and a happy faculty of bringing out the distinctive traits of his humble compatriots in pleasant verse and beguiling tales, has made his work welcome among American as well as British readers. Representative are: *Shuilers from Heathy Hills* (1893); *Through the Turf Smoke* (1899), short stories and sketches; *Donegal Fairy Tales* (1900); *The Bewitched Fiddle* (1900), short stories; *The Red Poocher* (1903); *A Lad of the O'Friels* (1903); *Yourself and the Neighbors* (1914). After 1900 MacManus frequently visited, and resided for long periods in or near, New York City. His later writing includes a number of plays, some of them in both English and Irish versions. Among them are *The Woman of Seven Sorrows, Orange and Green,* and *Mrs. Connolly's Cashmere.*

McMASTER, mak-mȧs′tẽr, JOHN BACH (1852–). An American historian, born in Brooklyn. He graduated at the College of the City of New York in 1872 and in 1877, having become known as a civil engineer and especially as a writer on engineering subjects, he was appointed an instructor at Princeton. This position he held until 1883, when he was chosen professor of American history at the University of Pennsylvania. In the same year appeared the first volume of his *History of the People of the United States*, designed to cover the period from 1783 to the outbreak of the Civil War. It was completed in eight volumes in 1913. Showing great research, particularly in its treatment of social and economic conditions, and written in a lively narrative style, it is justly considered a standard and thoroughly readable work. McMaster received honorary degrees from the University of Pennsylvania, Washington and Jefferson, and Toronto; he became a member of the National Institute of Arts and Letters, and in 1905 he served as president of the American Historical Association. Among McMaster's other writings are: *Bridge and Tunnel Centres* (1876); *High Masonry Dams* (1876); *Benjamin Franklin as a Man of Letters* (1887); *Origin, Meaning, and Application of the Monroe Doctrine* (1893); *A School History of the United States* (1897); *A Primary School History of the United States* (1901); *Daniel Webster* (1902); *Brief History of the United States* (1907); *The Struggle for the Social, Political, and Industrial Rights of Man* (1903); and several chapters in vol. vii of the *Cambridge Modern History* (1903).

McMECHEN, mak-mĕk′en. A city in Marshall Co., W. Va., 5 miles south of Wheeling, on the Baltimore and Ohio Railroad (Map: Virginia, D 2). It has no manufactories, being essentially a residential suburb of Benwood, which it adjoins. Pop., 1900, 1465; 1910, 2921.

MACMILLAN, mak-mĭl′an, DANIEL (1813–57). The founder of a well-known publishing house, born at Upper Corrie, in the island of Arran, Scotland, Sept. 13, 1813. His father, Duncan Macmillan, a poor farmer, moved to Irvine with his 10 children in 1815, where Daniel attended the common school. After serving as assistant to the bookseller Johnson in Cambridge, he was for six years with Seeley of Fleet Street. In 1843 he began business for himself in Aldersgate Street, first as bookseller, and a little later as publisher also. Towards the end of the same year he and his brother Alexander bought out Newby's business in Cambridge. It was in 1850 that the firm finally assumed the name Macmillan & Co., which in less than half a century was to become one of the greatest publishing houses in the world. Its first great successes were Kingsley's *Westward Ho!* (1855) and *Tom Brown's School Days* (1857). After the sudden death of Daniel Macmillan on June 27, 1857, the business was carried on solely by his brother, ALEXANDER MACMILLAN (1815–96), a publisher of great enterprise and skill. In 1858 he transferred the business to London, and, as trade expanded, he opened a branch house in New York. Among his notable literary undertakings were the "Golden Treasury Series" (1861 et seq.) and the Globe editions (1864 et seq.). A generous measure of the best books of England in all fields of literature and science that have appeared since the middle of the nineteenth century bear the Macmillan imprint. In 1859 the company began the issue of *Macmillan's Magazine*, the first shilling magazine.—SIR FREDERICK ORRIDGE MACMILLAN (1851–), a son of Daniel, became president of the Macmillan Company on its organization as a limited-liability company in 1893, and also a director in the American Macmillan Company, a separate business, still closely associated with the English house. He was president of the Publishers' Association of Great Britain and Ireland in 1900, 1901, 1911, and 1912, and in 1909 was knighted.—GEORGE A. MACMILLAN (1855–), son of Alexander, who entered the firm in 1879, received the Oxford honorary D.Litt.—MAURICE CRAWFORD MACMILLAN (1853–), second son of Daniel, also became identified with the firm. Consult: Hughes, *Memoir of Daniel Macmillan* (London, 1882); *Bibliographical Catalogue of Macmillan and Company's Publications* (ib., 1891 et seq.); *Life and Letters of Alexander Macmillan* (New York, 1910).

McMILLAN, SIR DANIEL HUNTER (1846–). A Canadian administrator. He was born at Whitby, Ontario, and was educated in the public and high schools. He early joined the militia, served during the Fenian Raid (1866), in the Red River Expedition (1870), also during the Northwest Rebellion (1885) as major, and later became lieutenant colonel of the Ninety-fifth Regiment. In 1870 he removed to Winnipeg and engaged in business. He was elected the first president of the Winnipeg Grain and Produce Exchange in 1887 and subsequently became prominently identified with several financial and fiduciary corporations. He served as a Liberal member of the Provincial Legislature from 1880 to 1900; was Provincial Treasurer of Manitoba in 1889–1900, and in 1900–11 was Lieutenant Governor. In 1902 he was created K. C. M. G.

MACMILLAN, HUGH (1833–1903). A Scottish Presbyterian minister and author. He was educated at Edinburgh University and among other pastorates held that of Free St. Peter's Church in Glasgow. He delivered lectures on several foundations, was Moderator of the General Assembly of the Free Church in 1897, and received numerous other honors. His books, many of which have been translated into continental languages, include: *Bible Teachings in Nature* (1866), which was still in print in 1912; *The True Vine* (1871); *The Sabbath of the Fields* (1876); *The Riviera* (1885); *Roman Mosaics* (1888); *The Spring of the Day* (1898); *Gleanings in Holy Fields* (1899); *The Corn of Heaven* (1901); *The Poetry of Plants* (1902); and, posthumously published, *The Touch of God, and Other Sermons* (1903); *Rothiemurchus* (1907); *The Isles and the Gospel, and Other Bible Studies* (1907).

McMILLAN, JAMES (1838–1902). An American capitalist and politician, born at Hamilton, Ontario, Canada. Having removed to Detroit in 1855, he was there for a time purchasing agent of the Detroit and Milwaukee Railway Company and in 1864 assisted in the organization of the Michigan Car Company. From this were developed a car-wheel, an iron-furnace, and a steam-forge company, of all of which he became president. In 1889 he was elected to the United States Senate, where he retained his seat until his death. His benevolences, particularly in Detroit, were noteworthy. To the University of Michigan he presented one of the most important Shakespeare libraries in the United States.

MACMILLAN, JOHN (1670–1753). Founder of the Reformed Presbyterian church of Scotland. He was born at Barncachla, Kirkcudbrightshire, studied at Edinburgh, was licensed to preach in 1700, and became minister of Balmaghie the following year. His views were those of the "remnant" of Cameronians, and in consequence his relations with the presbytery were not harmonious. He was deposed in 1703, but continued popular with his people and remained as minister, in spite of attempts to supplant him, till 1715, when he voluntarily withdrew. In 1706 he formally joined the Cameronians and gave the rest of his life to organizing and strengthening the sect. His followers were sometimes called Macmillanites. See CAMERONIANS; CAMERON, RICHARD; PRESBYTERIANISM.

MACMILLEN, FRANCIS (1885–). An American violinist, born at Marietta, Ohio. He began his musical studies with B. Listemann in Chicago and in 1895 went to Berlin, where he studied for five years under Halir and Joachim. In 1900 he entered the Brussels Conservatory for further study with César Thomson. His début took place in Brussels in 1903. Having established a reputation through his tours of Germany he returned in 1906 to his native country, where he was cordially received. In 1912 he went to St. Petersburg, and spent an entire year studying with Leopold Auer (q.v.), changing (as he himself claims) his technic completely. At any rate, when he reappeared in 1914 it was evident that his tone, always noble and pure, had gained in beauty and power.

McMINNVILLE, mȧk-mĭn′vĭl. A city and the county seat of Yamhill Co., Oreg., 41 miles by rail southwest of Portland, on the Yamhill River, and on the Southern Pacific Railroad (Map: Oregon, B 2). McMinnville College (Baptist) was established here in 1858, and there are also a Carnegie library, a beautiful park, a large auditorium, and a State Experiment Station. The city carries on a flourishing trade in wheat, fruit, hops, live stock, wool, and lumber, and has flouring and lumber mills. The water works and electric-light plant are owned by the municipality. Pop., 1900, 1420; 1910, 2400.

McMINNVILLE. A town and the county seat of Warren Co., Tenn., 103 miles by rail southeast of Nashville, on the Nashville, Chattanooga, and St. Louis Railroad (Map: Tennessee, E 3). It has the Southern School of Photography, Faulkner Mineral Springs, a park, and a fine courthouse. The town is surrounded by a fine agricultural, lumbering, and stock-raising region; it carries on a trade in mules, poultry, and grain; and there are manufactures of lumber, flour, cotton and woolen goods, coffins, spokes and handles, furniture, foundry and machine-shop products, etc. The water works and electric-light plant are owned by the city. Pop., 1900, 1980; 1910, 2299.

MacMONNIES, mȧk-mŭn′ĭz, FREDERICK (WILLIAM) (1863–). One of the foremost American sculptors of his day, also a painter of note. He was born in Brooklyn, Sept. 20, 1863. His father was of Scottish descent and his mother a niece of the American painter Benjamin West. At 17 he entered the New York atelier of Augustus Saint-Gaudens as an assistant, studying in the evening at the National Academy of Design and at the Art Students' League. In 1884 he went to Paris, to which, after a year spent in studying painting at Munich, he returned to enter the atelier of Falguière. Two years later he established an atelier of his own. His statue of Diana won honorable mention at the Salon of 1889. The statue of Nathan Hale, now in City Hall Park, New York, and that of James S. T. Stranahan, in Prospect Park, Brooklyn, were exhibited in the Salon of 1891 and brought him a second medal, the first time an American had been thus honored. The Hale statue admirably renders the lofty sentiment of the youthful patriot; the Stranahan is celebrated for the cleverness with which the details of silk hat and cane are managed. In the Salon of 1892 MacMonnies exhibited the little fountain figure called "Pan of Rohallion," and the "Boy with a Heron," the first of a series of fanciful bronzes of bewitching grace. The most important of his works, and the one which has done most to secure his reputation, was the colossal fountain in the Court of Honor at the Columbian Exposition (Chicago, 1893). In a wonderful decorative boat, propelled by eight stalwart oarswomen (the "Arts and Industries"), with "Fame" at the prow and "Father Time," "Columbia" sat enthroned—the whole being pronounced by competent critics the finest piece of sculpture on the grounds. In 1894–95 MacMonnies modeled the imposing monument at West Point. His statue of a nude Bacchante, exhibited in the Salon of 1894, was bought for the Luxembourg Gallery. The attempt to place a replica of this statue (now in the Metropolitan Museum, New York) in the court of the Boston Public Library excited much prudish criticism. MacMonnies' remarkable activity produced a statue of Sir Henry Vane (Boston Public Library); the Army and Navy groups for the Soldiers' and Sailors' Monument in Indianapolis; much work for the Congressional Library in Washington, including the central bronze doors and a statue of Shakespeare; and, his most extensive work in bronze, the sculptural decorations of the triumphal arch at the main entrance to Prospect Park, Brooklyn. These comprise three colossal groups in bronze: "The Army," a group of soldiers in active combat; "The Navy," a group of men standing in restrained and quiet poses; and, above, "America," in her chariot and heralded by winged victories. The two groups of athletes and horses at the southern entrance to Prospect Park are fine examples of park sculpture in bronze. Other noteworthy sculptures by MacMonnies are the statue of General Slocum (1900, Brooklyn); an equestrian statuette of Theodore Roosevelt (1905); equestrian statue of General McClellan (1906, Washington); the Pioneer monument at Denver. In 1903 he began to devote himself to painting. Of considerable merit are his impressionist portraits of the sculptor John Flanagan, the curé of Givernay, Georges Thesmar, and his first wife (see LOW, MARY FAIRCHILD) and his children. Yet it was fortunate that in 1913 he returned to sculpture. In this field alone his great talent, especially as a brilliant technician, is fully manifest. Besides other honors, he received a medal at the World's Fair, Chicago, in 1893, and a gold medal at Buffalo in 1901. He was made Chevalier of the Legion of Honor in 1898 and won a grand prize of honor at the Paris Exposition of 1900, was elected to the National Academy of Design in 1906, and became a member of the National Institute of Arts and Letters. Consult: Greer, in *Brush and Pencil* (Chicago, 1902); the admirable chapter "MacMonnies," in Lorado Taft, *History of American Sculpture* (New York, 1903); and, for his portrait painting, Pettie, in the *International Studio*, vol. xxix (ib., 1906).

MACMUL'LEN, WALLACE (1819–99). An Irish Wesleyan Methodist preacher, born in the Ards, County Down. Accepted as a candidate for the ministry in 1840, for years he labored in some of the hardest circuits. In 1859 he became connected with the home-mission board of the Irish Wesleyan Conference, and in its interest he continued to labor until his death, with the exception of five years. For the last 20 years of his life he was general secretary of the home-mission fund. In 1876 he was the leader of a group of men who were the authors of the plan for lay delegation subsequently adopted by the conference, and he was also a leader in the movements culminating in the consolidation of Irish Methodism. He was frequently a representative to the British Conference; was elected to the Legal Hundred in 1871 and served four times as vice president; was fraternal delegate to the General Conference of the Methodist Episcopal Church in 1880, and also represented the British and Irish conferences at the General Conference of the Methodist Church in Canada; was a member of the Ecumenical Methodist Conference of 1881; and for many years served as the chairman and treasurer of the Wesley College committee. During much of his life he resided in Dublin, and it was there that he died. Widely known as an eloquent speaker, he was in much demand for great occasions. His brother came to the United States and was for many years a pastor in the New York East Conference of the Methodist Episcopal Church. For his nephew, see the following article.

MACMULLEN, WALLACE (1860–). An American Methodist Episcopal theologian. He was born in Dublin, Ireland, a nephew of the noted Irish Wesleyan Methodist minister of the same name. Early coming to the United States, he graduated from Drew Theological Seminary in 1888 and entered the ministry in the same year. He was pastor successively of a Methodist church at Springfield, Mass., Grace and Park Avenue churches, Philadelphia, and the Madison Avenue Church, New York. In 1913 he was elected professor of homiletics in Drew Seminary. He is author of *The Captain of our Faith* (1904) and *The Child and the Kingdom* (1907).

MacMUR'RAY, JOHN. See MURRAY, JOHN.

McMURRICH, măk-mŭr'ĭk, JAMES PLAYFAIR (1859–). A Canadian anatomist, who for many years was resident in the United States. He was born in Toronto, Canada, graduated from the University of Toronto in 1879, and in 1885 took his Ph.D. at Johns Hopkins, where he was an instructor in mammalian anatomy in 1884–86. He served as professor of biology at Ontario Agricultural College (1882–84), at Haverford (1886–89) and at Cincinnati (1892–94), as docent and assistant professor of animal morphology at Clark University (1889–92) and as professor of anatomy at the University of Michigan (1894–1907) and at Toronto after 1907. He was also an instructor at Woods Hole, Mass., in 1887–91, and served as president of the American Society of Naturalists in 1907 and of the American Association of Anatomists in 1908. He published *A Textbook of Invertebrate Morphology* (1894; 2d ed., 1896) and *The Development of the Human Body* (1902; 4th ed., 1913), and edited Sobotta's *Atlas and Textbook of Human Anatomy* (1906–07) and Morris's *Human Anatomy* (1907).

MACMURROUGH, măk-mûr′rŭᴋ, Dermot (Diarmait mac Murchadha) (c.1110–71). King of Leinster in Ireland from c.1135 to 1171. In 1166, being driven out by O'Ruairc, Lord of Breifne, whose wife he had abducted 14 years before, he fled to England and appealed to Henry II for aid. Henry was unable to go to Ireland in person, but authorized any of his subjects to do so. Richard of Clare, called Strongbow, was the chief leader of the force of adventurers that invaded Ireland and established themselves in the eastern part of the island (see Ireland); he afterward married Dermot's daughter. Dermot was successful for a time and hoped to conquer all Ireland. Consult F. P. Barnard (ed.), *Strongbow's Conquest of Ireland* (New York, 1888), and H. W. C. Davis, *England under the Normans and Angevins* (New York, 1905). See Henry II, King of England.

McMUR′RY, Charles Alexander (1857–). An American educator, a brother of Frank Morton McMurry. He was born at Crawfordsville, Ind., graduated at the Illinois State Normal University in 1876, and studied at the University of Michigan (1876–80) and at Halle (Ph.D., 1887) and Jena. After teaching for several years, he was principal of the practice school of the Illinois State Normal University (1899–1900), and held a similar position at the Northern Illinois Normal School (1900–01). His works include: *The Elements of General Method* (1892; 6th ed., rev., 1903); *Method of the Recitation* (1898), with F. M. McMurry; *Special Method of Reading* (1898; new ed., 1910); *Special Method in Literature and History* (1898); *Special Method in Geography* (1898); *Special Method in Natural Science* (1896; 2d ed., 1899); *Pioneer History Stories* (3 vols., 1891; 5th ed., 1898); *Special Method in Primary Reading and Oral Work* (1903); *Special Method in Reading in the Grades* (1908); *Handbook of Practice for Teachers* (1914); *Conflicting Principles of Teaching and How to Adjust them* (1915).

McMURRY, Frank Morton (1862–). An American educator, a brother of Charles Alexander McMurry. Born near Crawfordsville, Ind., he studied at the University of Michigan and afterward at Halle and Jena (Ph.D., 1889) and in Geneva and Paris (1892–93). He was professor of pedagogics and training at the Illinois State Normal University in 1891–92, and subsequently professor of pedagogy at the University of Illinois (1893–94), principal of Franklin School, Buffalo (1894–95), and dean of Teachers College, University of Buffalo (1895–98). In 1898 he was appointed professor of elementary education at Teachers College, Columbia University. With Ralph S. Tarr he published the *Tarr and McMurry Common School Geographies* (1900), and with C. A. McMurry *Method of the Recitation* (1903). He is sole author of *How to Study and Teaching How to Study* (1909) and *Elementary School Standards* (1913).

McMUR′TRY, Lewis S. (1850–). An American surgeon. He was born at Harrodsburg, Ky., and studied at Centre College in his native State (A.B., 1870) and at Tulane University, New Orleans (M.D., 1875). Establishing himself in practice in Louisville, he became professor of gynecology and abdominal surgery in the university of that city. In 1905 he was president of the American Medical Association. Tulane gave him an honorary LL.D. in 1909. Besides contributing to medical journals, McMurtry published a *Textbook of Surgery* and contributed to the *International Textbook of Surgery.*

MacNAB′, Sir Allan Napier (1798–1862). A Canadian political leader and soldier, born at Newark (now Niagara), Ontario. He entered the British navy as a midshipman in 1813. Leaving the navy, he became an ensign in the army, served throughout the War of 1812–15, and took part in the actions at Fort Erie and Black Rock and commanded the advance at the battle of Plattsburg. At the close of the war he remained in Canada, studied law, and was admitted to practice at the Canadian bar in 1826. He was elected to the Upper Canada Legislative Assembly in 1830 and was Speaker of that body in 1837–41. He was prominent in sustaining the government against Mackenzie's insurrection in 1837–38. While he was in command at Niagara the steamer *Caroline,* employed by American sympathizers to assist the rebels, was, by his order, seized, fired, and sent over Niagara Falls. (See Caroline, The.) MacNab was rewarded by being knighted. After the union of Upper and Lower Canada in 1841 he was leader of the Conservative Opposition until 1844, Speaker of the Legislative Assembly (1844–48), and in the latter year again Speaker of the Assembly. In 1854–56 he was Premier of Canada, his colleague, A. N. Morin, being the chief representative of Lower Canada in the cabinet. Its leading member was, however, Mr. (afterward Sir) John A. Macdonald; and it was mainly through the latter's efforts that a measure abolishing the clergy reserves was passed (1854). MacNab retired from the leadership of the Conservatives in 1857 and went to England. In 1858 he was made a baronet, and in 1860, on his return to Canada, he became a member of the Legislative Council, of which he was elected Speaker in 1862.

MACNAGHTEN, m*a*k-na̤′t*e*n, Edward, first Baron (1830–1913). A British jurist, born in County Antrim, Ireland. He was educated at Trinity College, Cambridge (M.A.); studied law at Lincoln's Inn, where he became a barrister and bencher; subsequently he was made queen's counsel. He served in Parliament in 1880–87, was appointed Lord of Appeal-in-Ordinary in 1887, and was created a baron in the same year. For many years before his death he had been one of the most prominent figures on the bench.

McNAIR′, Frederick Vallette (1839–1900). An American naval officer, born at Jenkintown, Pa. Graduating from the United States Naval Academy in 1857, he became a lieutenant in 1861, lieutenant commander in 1864, commander in 1872, captain in 1883, and rear admiral in 1898. During the Civil War he participated in many important engagements, first on the *Iroquois* (1861–62) and afterward on the *Juniata*

(1862–63, 1864–65) and the *Seminole* (1863–64). In 1875–78 he commanded the *Kearsarge* on the Asiatic Station and in 1887–89 he had command of the *Omaha*. In 1890 he became superintendent of the Naval Observatory, in 1895 commander in chief of the Asiatic Station, and in 1898 superintendent of the Naval Academy. While serving in the last-named capacity he was given charge of Admiral Cervera and other distinguished prisoners of the Spanish-American War.

MACNAMARA, măk′nȧ-mä′rȧ, Thomas James (1861–). A British educator and politician. He was born in Montreal, Canada, but early went to England. After a course at the Borough Road Training College for Teachers, London, he taught (1876–92); was editor of the *Schoolmaster* (1892–1907); served on the London school board (1894–1903); and in 1896 was president of the National Union of Teachers. He was elected to Parliament as Liberal member for North Camberwell in 1900, and in 1906 played a conspicuous part among the supporters of the Liberal government's Educational Bill. He became parliamentary secretary to the Admiralty in 1908 and Privy Councilor in 1911. He published: *Schoolmaster Sketches* (1896); *Schools and Scholars* (1900); *School-Room Humour* (1905); *The Gentle Golfer* (1906); *Tariff Reform and the Working Man* (1910).

MacNAUGHTON, mak-nạ′ton, Myra Kelly. See Kelly.

MacNEIL, măk-nēl′, Hermon Atkins (1866–). An American sculptor. He was born at Chelsea, Mass., and studied at the Massachusetts Normal Art School in Boston and under Chapu and Falguière in Paris. On his return to America he was awarded the designer's medal for his work at the Columbian Exposition (1893). His bronze reliefs of the life and death of Père Marquette (Marquette Building, Chicago) are the first of a series of Indian subjects for which he has become famous. In 1896 he won the Rinehart scholarship and spent four years of study in Rome; in 1900 he aided in the decoration of the American pavilion at the Paris Exposition, and in 1904 modeled the main fountain at the St. Louis Exposition. He made his home on Long Island. His art is typically American. His figures and groups are admirably modeled and compactly constructed, yet possess charming elaboration of detail. The best of his Indian subjects are "Sun Vow," modeled at Rome (privately owned; smaller replicas in the Metropolitan Museum and Corcoran Gallery, Washington); "Primitive Chant" (Peabody Institute, Baltimore, and Metropolitan Museum, New York); "The Coming of the White Man," a group in the City Park, Portland, Oreg.; "The Moqui Prayer for Rain," statuette (Art Institute, Chicago). Proof of his great versatility is furnished by the relief "From Chaos Came Light"; the McKinley Memorial (1907, Columbus, Ohio); the Platt Memorial, State Capitol, Hartford; the Soldiers' and Sailors' Memorials at Whitinsville, Mass., and Albany, New York; the ideal works "Repose" and "Inspiration" (1912); and the three powerful female busts "Agnes" and "Beatrice" and that of Miss Longman, the sculptor. MacNeil received many awards, including gold medals at Buffalo (1901), Charleston (1902), St. Louis (1904), and Buenos Aires (1910).

His wife, Carol Brooks MacNeil (1871–), was born in Chicago and studied there at the Art Institute under Taft and in Paris under MacMonnies and Injalbert. She modeled many charming and unique designs for vases, teapots, inkstands, and other decorative and useful objects, as well as children's busts, including those of her two sons, and statuettes.

McNEILE Hugh (1795–1879). A British churchman. He was born at Ballycastle, County Antrim, Ireland; graduated at Trinity College, Dublin, in 1815; and early studied law. After 1820 he held various curacies, St. Paul's Church, Liverpool, being built for him. In 1845 he was appointed canon of Chester Cathedral, and in 1860 canon residentiary. He became dean of Ripon in 1868, but resigned from that position in 1875 and retired to Bournemouth. Although at one time inclined to embrace the doctrines of Edward Irving (q.v.), he afterward reviewed them severely in three sermons on *Miracles* (1831–32) and in *Letters to a Friend who had Felt it his Duty to Secede from the Church of England* (1834). Other works are: lectures on *The Prophecies Relative to the Jewish Nation* (1830); *The Church of England* (1840); *The Sympathies, Sufferings, and Resurrection of the Lord Jesus Christ* (1843); *Sermons on the Second Advent of Christ* (1865); *Letters on the Athanasian Creed* (1873); *Scripture Proportions* (1873). His collected works began to appear in 1877. Consult *Hugh McNeile and Reformation Truth* (London, 1882).

McNEILL, John (1854–). A British Presbyterian preacher, born in Houston, Renfrewshire, the son of a quarry foreman. From 1869 to 1877 he was a railway employee, and then studied for the ministry at Edinburgh and Glasgow universities and at the Free Church Divinity Hall in Glasgow. In 1886–89 he preached in Edinburgh and then for three years at the Regent Square Presbyterian Church in London. In 1892 he joined D. L. Moody as a revival preacher in Aberdeen and during the next six years conducted mission services in many different parts of the world. He became pastor of these Presbyterian churches: Christ, Westminster Bridge Road, London (1908); St. George's, Liverpool (1910); Cook's, Toronto, Canada; and the Central, Denver, Colo. (1915).

MacNEVIN, William James (1763–1841). An American physician. Born at Ballynahowne, County Galway, Ireland, he was sent when 12 years old to Vienna, where his uncle, Baron O'Kelly MacNevin, was physician to the Empress Maria Theresa. He received his medical training at Prague and Vienna (M.D., 1784) and then returned to Ireland. As one of the leaders of the United Irishmen he was kept in prison from 1798 to 1802. After his release he served for three years in the French army, and in 1805 he came to the United States. At the College of Physicians and Surgeons, New York, where he became professor of obstetrics in 1808 and professor of chemistry and materia medica in 1811, he was the first to open a chemical laboratory. Resigning his chair in 1826, he joined Valentine Mott (q.v.) in establishing a new medical school, but this existed only four years. MacNevin was the author of *Rambles through Switzerland* (1803); *Pieces of Irish History* (1807), with Thomas Addis Emmet; *Chemical Examination of the Mineral Waters of Schooley's Mountains* (1815); *Exposition of the Atomic Theory of Chemistry* (1819). He also served as associate editor of the *Medical and Philosophical Journal* (New York).

MACOMB, mȧ-kōm′. A city and the county seat of McDonough Co., Ill., 59 miles northeast of Quincy, on the Chicago, Burlington, and Quincy Railroad (Map: Illinois, C 5). It is the seat of the Western Illinois State Normal School, and has a Carnegie library, high school, and three large hospitals. The surrounding agricultural region is productive, and the city has extensive manufactures of stoneware, bricks, foundry products, and sewer pipe. The vicinity abounds in clay. Settled about 1840, Macomb was incorporated in 1857. Under a charter of 1872 the government is vested in a mayor, biennially elected, and a city council. The water works are owned by the municipality. Pop., 1900, 5375; 1910, 5774. The city was named after General Macomb, who distinguished himself in the battle of Plattsburg. See PLATTSBURG.

MACOMB, ALEXANDER (1782–1841). An American soldier, prominent in the War of 1812. He was born in Detroit, Mich., entered the United States army as a cornet of cavalry in 1799, and by 1812 had risen to be lieutenant colonel of engineers and adjutant general of the army. Soon after the outbreak of the War of 1812 he was transferred to the artillery at his own request, and in 1813, as colonel of the Third Artillery, distinguished himself at Fort Niagara and Fort George. In January, 1814, he was promoted to be brigadier general and placed in command of the northern frontier, along Lake Champlain, and on September 11 of this year, while McDonough was defeating the English fleet in Plattsburg Bay, he defended Plattsburg, N. Y., against the attack of a greatly superior English force under Sir George Provost. In recognition of his services on this occasion he was promoted to be major general, and received a vote of thanks and a medal from Congress. After the war he continued in the service as colonel of engineers, and from 1828 until his death was the commanding general of the United States army. He published *A Treatise on Martial Law and Courts-Martial as Practiced in the United States* (1809) and *A Treatise on the Practice of Courts-Martial* (1840). Consult Richards, *Memoir of Alexander Macomb* (New York, 1833).

MÂCON, mȧ′kôɴ′. The capital of the Department of Saône-et-Loire, France, in Burgundy, 45 miles north of Lyons, on the Saône, which is here spanned by a bridge of 12 arches to the suburb, St. Laurent (Map: France, N., K 6). It has the ruins of the cathedral of St. Vincent, begun in the thirteenth century, and the modern church of St. Pierre, a large edifice in the Romanesque style. Mâcon trades extensively in agricultural products, has important watchmaking establishments, and manufactures copper and bronze ware, machinery, tools, paper, and oil; it is best known, however, as a centre of the Burgundy wine industry. Mâcon is the ancient Matisco, a town of the Ædui. It is the birthplace of the poet, Lamartine. Pop., 1901, 18,928; 1911, 19,851.

MACON, mā′kon. A city and the county seat of Bibb Co., Ga., 93 miles by rail southeast of Atlanta, on the Ocmulgee River, and on the Southern, the Central of Georgia, the Georgia Southern and Florida, the Macon, Dublin, and Savannah, the Georgia, and the Macon and Birmingham railroads; and there is steamboat connection with Brunswick and Savannah (Map: Georgia, C 3). It is the seat of Mercer University (Baptist), St. Stanislaus College (Roman Catholic), Wesleyan Female College, chartered in 1836, Mount de Sales Academy (Roman Catholic), the State Academy for the Blind, Ballard Normal School (colored), Central City College (colored), and several orphan schools. There are two public libraries, a United States government building, a fine city hall, United States Weather Bureau station, an Academy of Music, armories, and Central City, Tatnall Square, and Crumps parks. The Indian mounds in the vicinity are also of interest. The city is in a rich agricultural, fruit-growing, and cotton-raising region; has an extensive trade in cotton, lumber, and general merchandise; and its manufacturing industries are represented by large cotton and knitting mills, the shops of four railroads, employing almost 2000 men, brick factories, lumber mills, foundries and machine shops, flouring mills, etc. Excellent water power is afforded by a $3,000,000 dam, 30 miles above Macon, on the Ocmulgee River. Macon was incorporated as a town in 1823, having been settled shortly before, and in 1832 received a city charter. Its present government is administered under a charter of 1914, which provides for a mayor and a council of 12 members, chosen biennially, and two commissions, each of three members elected by the people, which control the police and fire departments and the water-works system. The water works are owned by the city. Macon's income in 1912–13 was $1,142,000, while its payments amounted to $1,164,000, the principal items of expense being $115,000 for education, $75,000 for police department, $89,000 for fire department, and $54,000 for the water-supply system. Pop., 1900, 23,272; 1910, 40,665; 1914, 41,992; 1920, 52,995.

MACON. A city and the county seat of Macon Co., Mo., 70 miles west by south of Quincy, Ill., on the Chicago, Burlington and Quincy and the Wabash railroads (Map: Missouri, D 2). It has the county insane asylum, Western College, an osteopathic sanitarium, a high school, a fine courthouse, and private educational institutions. The city is the centre of a fertile agricultural district having coal and timber, and there are coal mines, flour mills, creameries, carriage and wagon factories, foundries and machine shops, and manufactories of shears, dishwashing machines, cement blocks, cigars, etc. The water works and electric-light plant are owned by the municipality. Pop., 1900, 4068; 1910, 3584.

MACON, NATHANIEL (1758–1837). An American political leader. He was born of Huguenot parentage at Macon Manor in Warren County, N. C., Dec. 17, 1758; studied at the College of New Jersey (Princeton) from 1774 to 1776; served in the summer of 1776 in a company of New Jersey militia; returned home in the fall, and devoted the next three years chiefly to reading law and English history. In 1780 he joined a company of North Carolina militia under Major Benjamin Seawell and fought in the battle of Camden. The same year he was elected to the State Senate, in which body, taking his seat in June, 1781, and serving until December, 1785, he was a leading promoter of several reform measures, and a particularly persistent advocate of a metallic currency. In 1786 Macon was elected a delegate to the Continental Congress, but declined to take his seat, preferring State to national service. He belonged to the party which in 1788 vigorously opposed the ratification of the Federal

Constitution, but when, a year later, that party had become unpopular in his section of the State, he acquiesced, and, having been elected the first member from his district to a seat in the national House of Representatives, he served there continuously from 1791 to 1815, and was Speaker of the House from December, 1801, to October, 1807. He speedily became the recognized leader of the North Carolina delegation, was a severe critic of Hamilton's administration of the Treasury, advocated the increase of the United States naval force to overpower the Barbary pirates, and was one of the stanchest opponents of the bill providing for the execution of Jay's Treaty. He pleaded that the Sedition Law was unconstitutional and in so doing laid down the ultra States' rights doctrine that "This government depends upon the State Legislatures for existence. They have only to refuse to elect State Senators to Congress and all is gone."

As Speaker, Macon was a stanch supporter of Jefferson's first administration except that at its close he began, through the influence of John Randolph, to suspect that Madison, the Secretary of State, was implicated in the Yazoo frauds. At the beginning of Jefferson's second administration Macon reappointed Randolph, who had lost prestige with his party, chairman of the Committee on Ways and Means, and after Randolph refused to bring in a bill, upon the President's recommendation, for the purchase of Florida, Macon, Randolph, and Joseph H. Nicholson became leaders of a faction known as the "Quids," who directed their main efforts towards making Monroe, instead of Madison, the next President. Macon, also, in the interest of the agrarian supremacy of the South and consistently with his doctrine of State sovereignty, opposed the bill for abolishing the foreign slave trade, and continued his strenuous opposition to measures for the protection of trade and the defense of the coast other than by gunboats. He broke with Randolph in 1807 and returned to the support of Jefferson, the embargo, and the bill for a larger army. He seems to have coöperated with Madison and Gallatin in framing the "Macon Bill No. 1" for the exclusion of foreign war vessels from United States ports, for the suppression of illicit trade carried on by foreign merchants under the United States flag, for prohibiting the importation of goods from England or France except directly from those countries or in vessels manned wholly by citizens of the United States, and for authorizing the President to suspend these regulations in favor of either belligerent that should cease hostilities towards the trade of the United States. The bill passed the House in January, 1810, but was defeated in the Senate. "Macon's bill No. 2," which became a law in May, 1810, and provided for the repeal of the Nonintercourse Act of 1809, was Macon's only in name, its author being John Taylor, of South Carolina; and Macon voted against its final passage because of a protective clause which it contained. He voted, in June, 1812, for the declaration of war against Great Britain, and was made chairman of the committee of Congress to report on the enemy's "spirit and manner" of warfare. When peace had been restored he was opposed to the maintenance of a large standing army, saying: "The true way to safety is the militia, and the way to make our militia efficient is to let them know that the safety of the nation depends on them."

In December, 1815, Macon was elected to the United States Senate, where he served until 1828, the last two years as president pro tem. Advocating a "hard-money" currency, he voted against the bill for reëstablishing the National Bank, and continued to the close of his public life a firm believer in the "old Republican doctrines," too much so to be an administration leader under President Monroe. In 1824 he received Virginia's vote for the vice presidency. Macon retired from the Senate in 1828 of his own accord, and until his death, June 29, 1837, lived in seclusion on his plantation, except that in 1835 he served as chairman of the North Carolina Constitutional Convention and in 1836 was a presidential elector. In 1830 Randolph-Macon College was named for him and John Randolph. Consult: E. M. Wilson, *The Congressional Career of Nathaniel Macon* (Chapel Hill, N. C., 1900), and W. E. Dodd, *The Life of Nathaniel Macon* (Raleigh, N. C., 1903).

MACORIS, mȧ'kṓ'rēs'. A seaport of the Republic of Santo Domingo, situated on the south coast of the island of Haiti, on the Bay of Dos Ríos, 43 miles east of Santo Domingo. It has a number of sugar factories and carries on an active import and export trade. It is the seat of a United States consular agent. Pop., 7000.

MACOUN, mȧ-ko͞on', JOHN (1832–). A Canadian naturalist, born and educated in Ireland. He came to Canada in his nineteenth year, and in 1868 was appointed professor of botany and geology in Albert College, Belleville, but resigned in 1879 to accept government work in connection with an expedition to ascertain the natural resources of part of the Northwest Territories. Subsequently he was employed by the Canadian government in other scientific work in his department. In 1882 he was appointed botanist to the Geological and Natural History Survey of Canada, and in 1887 was made assistant director of the survey. He prepared several valuable catalogues of Canadian plants and birds for the Geological Survey. Several foreign and Canadian learned societies admitted him to honorary membership. In addition to numerous scientific papers and reports he wrote: *Manitoba and the Great Northwest* (1882); *The Forests of Canada and their Distribution* (1895); *Report on the Yukon Country* (1902).

MACOYA, mȧ-kō'yȧ, or MACAHUBA PALM. A kind of palm. See MACAW TREE.

MACPHAIL, mak-fāl', ANDREW (1864–). A Canadian physician, author, and editor. He was born at Orwell, Prince Edward Island, and was educated at Prince of Wales College, Charlottetown, and at McGill University. After a medical course at McGill and further study in London, England, he returned to Canada and was professor of pathology in the University of Bishop's College, Lennoxville, until 1907, when he became professor of the history of medicine in McGill University. He served as pathologist to the Western Hospital and the Protestant Hospital for the Insane (1895–1906). Besides his professorial duties at McGill, he practiced his profession and found time for literary work. In 1910 he became a fellow of the Royal Society of Canada and in 1911 a member of the Fleming Electoral Reform Committee (Canadian Institute). He wrote *Essays in Puritanism* (1905), *The Vine of Sibmah* (1906), *Essays in Politics* (1909), and *Essays* *in Fallacy* (1910); and edited the *Montreal Medical Journal* and the *University Magazine.*

MacPHEE, John Joseph (1860–). An American neurologist. He was born in Prince Edward Island, Canada; graduated from the medical department of the University of Vermont in 1890; and, settling in New York City, became neurologist to several hospitals, clinical professor of neurology at the New York Polyclinic Medical School, and later professor of nervous and mental diseases at the New York Postgraduate Medical School and Hospital. He contributed numerous articles to medical journals.

McPHER′SON. A city and the county seat of McPherson Co., Kans., 128 miles west by south of Topeka, on the Chicago, Rock Island, and Pacific, the Missouri Pacific, the Union Pacific, and the Atchison, Topeka, and Santa Fe railroads (Map: Kansas, E 6). It has McPherson College (German Baptist), Central Academy, a fine courthouse, Carnegie library, and a city park. The city is the commercial centre for an agricultural, dairying, and stock-raising region, and has grain elevators, flour mills, etc. McPherson adopted the commission form of government in 1914. The water works and electric-light plant are owned by the municipality. Pop., 1900, 2996; 1910, 3546.

MACPHERSON, Sir David Lewis (1818–96). A Canadian statesman, born Sept. 12, 1818, at Inverness, Scotland. Emigrating to Ontario in 1835, he entered a firm of railroad contractors and was subsequently president of the Interoceanic Railroad Company, which undertook to build a railroad through British Columbia, but the contract was given to the syndicate headed by Sir Hugh Allan. Having been a member of the Legislative Council of Canada from 1864 to 1867, he was called (1867) to the Dominion Senate, of which he was elected Speaker in 1880. In 1883 he resigned to become a member of the cabinet without portfolio, and in the same year he was appointed Minister of the Interior, a position which he held till 1885. For his services he was knighted in 1884. His publications consist of pamphlets relative to finance, such as *Banking and Currency* (1869). He died Aug. 16, 1896.

McPHERSON, Edward (1830–95). An American journalist, born at Gettysburg, Pa., where he studied at Pennsylvania College, graduating in 1848. After giving up the study of law he entered newspaper work. Becoming prominently identified with the organization in 1856 of the new Republican party at Harrisburg, where he lived, in 1858 and again in 1860 he was elected to Congress. He was Deputy Commissioner of Internal Revenue for a short time; clerk of the National House of Representatives (1863–73; 1881–83; 1889–91); permanent president of the Republican National Convention in 1876; and chief of the Bureau of Engraving and Printing (1877–78). For two years he was editor of the Philadelphia *Press.* He became editor of *The Handbook of Politics* in 1872, and from 1877 until his death was editor of the *New York Tribune Almanac.* He was also a political editorial writer on the *Tribune.* He published *A Political History of the United States during the Great Rebellion* (1865) and *A Political History of the United States during Reconstruction* (1870).

MACPHERSON, James (1736–96). "Translator" of the Ossianic poems, born at Ruthven, Inverness-shire, Scotland, Oct. 27, 1736. After finishing his studies at King's College, Aberdeen, he became a schoolmaster in his native village, published a poem entitled *The Highlander* in 1758, and in the following year, having met Dr. Alexander Carlyle, of Inveresk, and John Home, the author of *Douglas,* he showed them some fragments of Gaelic verse, of which he also gave them "translations." These "translations," 16 in number, appeared in 1760 under the title *Fragments of Ancient Poetry Collected in the Highlands.* They awakened so much attention that the Faculty of Advocates in Edinburgh raised a subscription to enable Macpherson to make a tour through the Highlands for the purpose of collecting more ancient Gaelic poems. The result was the publication in London of alleged translations of the poems of Ossian, bearing the titles *Fingal: An Epic Poem, in Six Books* (1762) and *Temora: An Epic Poem, in Eight Books* (1763). A storm of controversy arose in regard to their genuineness. Blair defended their authenticity; Dr. Johnson called for the Gaelic manuscripts, which were not forthcoming. Scholars are now agreed that though the so-called Ossianic poems are largely the work of Macpherson, yet they have a real basis in Gaelic legend. As a substantial result of his fame, Macpherson was appointed secretary to the Governor of Pensacola, West Florida, (1764), and London agent to the Nabob of Arcot (1781). He entered Parliament in 1780 as member for Camelford, sat for 16 years, and then retired to an estate which he had purchased in Inverness-shire, where he died Feb. 17, 1796. He wrote several historical works, notably *Original Papers, Containing the Secret History of Great Britain from the Restoration to the Accession of the House of Hanover, etc.* (1775). A staunch defender of Lord North's government, he drew a regular salary for his services in that connection. In accordance with his request his body was interred in Westminster Abbey. For the widespread interest in Macpherson's translations and their immense influence on literature, consult H. A. Beers, *English Romanticism* (New York, 1898), and Rudolph Tombo, Jr., *Ossian in Germany* (ib., 1905); for their relation to their originals, *Dean of Lismore's Book,* edited by MacLaughlan, with introduction by Skene (London, 1862), and *Poems of Ossian,* with translations by Clerk (Edinburgh, 1870). Consult also: *Poems,* translated by Macpherson, with introduction edited by Todd (London, 1888); *Life and Letters,* by Saunders (ib., 1894); A. Nutt, *Ossian and the Ossianic Literature* (ib., 1899), with important bibliographical appendix; J. S. Smart, *James Macpherson: An Episode in Literature* (ib., 1905). See Ossian.

McPHERSON, James Birdseye (1828–64). An eminent American soldier, prominent on the Federal side in the Civil War. He was born in Sandusky, Ohio; graduated first in his class at West Point in 1853, having as classmates such men as Philip H. Sheridan, John B. Hood, and John M. Schofield; and was appointed to the Corps of Engineers, with the rank of brevet second lieutenant. For a year after his graduation he was assistant instructor of practical engineering at the Military Academy, and was next engaged from 1854 to 1857 as assistant engineer upon the defenses of the harbor of New York and the improvement of Hudson River. In 1857 he superintended the building of Fort Delaware, and in 1857–61 was superintending engineer of the construction of the defenses of Alcatraz Island, at San Francisco, Cal. Upon the outbreak of the Civil War he was assigned to duty at Boston, where he raised a force of engineers; and in August, 1861, he was promoted to be captain of engineers. The following November he was made aid-de-camp to General Halleck and assistant engineer of the Department of the Missouri, with the rank of lieutenant colonel. From February to April, 1862, he served as chief engineer on the staff of General Grant, taking part in the capture of Fort Donelson and in the battle of Shiloh. In May, 1862, he was appointed brigadier general of volunteers and colonel in the regular army. He was with Halleck at the siege of Corinth; and when, after its capture by the Federal forces, the Confederates under Van Dorn and Price attempted to retake it in October, 1862, McPherson succeeded in penetrating their lines and reënforcing Rosecrans, who was holding the place with a force much inferior to that of the Confederates. For his services at Corinth McPherson was made major general of volunteers, Oct. 8, 1862. In December he was put at the head of the Seventeenth Corps, and had a distinguished share in Grant's Mississippi campaign, which terminated in the surrender of Vicksburg. After the fall of Vicksburg McPherson was, upon the recommendation of General Grant, appointed a brigadier general in the regular army and commander of the District of Vicksburg. In February, 1864, he was second in command to Sherman in the latter's expedition to Meridian, and on March 12 was made commander of the Department and Army of the Tennessee. In that command he maintained the reputation he had won in Mississippi, and rendered valuable service, during Sherman's campaign in Georgia. The Army of the Tennessee engaged the Confederates at Resaca May 14 and 15 and at Dallas May 28, 1864; and on June 27 McPherson aided Thomas in an unsuccessful assault upon Johnston's position at Kenesaw Mountain. Shortly thereafter he was engaged in the series of conflicts around Atlanta, in one of which, on July 22, 1864, he was killed while making a reconnoissance. General Grant, in a letter recommending him for promotion in 1863, praised him as "one of the ablest engineers and most skillful generals," and in his *Personal Memoirs* says: "In the death of McPherson the army lost one of its ablest, purest, and best generals."

McQUAID, m'-kwād′, Bernard John (1823–1909). An American Roman Catholic bishop. Born in New York City, he studied at Chambly College, near Montreal, and then entered St. John's College at Fordham, N. Y., where he graduated in 1843. Upon being ordained a priest in 1848, he was sent to South Orange, N. J., to found Seton Hall College and Seminary. Of this institution he was president for 10 years, during part of this time being also rector of the Newark Cathedral. In 1868 he was consecrated first Bishop of Rochester, N. Y. He devoted himself especially to the organization of parochial schools, lecturing and writing much on the subject.

MACQUARIE, mȧ-kwŏr′ĭ. An Australian river, a tributary of the Darling (q.v.).

MACQUARIE ISLAND. A subantarctic possession of Tasmania, in about lat. 55° S., long. 158° E. (Map: Antarctic Regions, G 7). The main island, 20 miles long by 3 broad, is the summit of a rocky submarine ridge which extends north and south. Its flora is scanty, consisting largely of tussock grass and the Maori cabbage. In the early part of the nineteenth century Macquarie Island was the breeding ground of fur seals, but their unregulated slaughter (35,000 by the first ship) soon exterminated the herds. To-day a fur seal is rarely seen. Birds, however, abound in countless numbers and sea elephants in great herds. The observers of the Mawson (q.v.) expedition report that (1912–13) there were several rookeries of sea elephants, in each of which there were from 400 to 500 cows. The king (second largest of the species) penguins were collected in rookeries, many thousands being seen. The royal penguins nest in countless swarms, and practically hide the ground over areas aggregating 26 acres. As the number annually killed reaches about 150,000 and no decrease is noticed, the entire colonies must approximate half a million. Sheep thrive, and rats are plentiful and troublesome. Macquarie Island is now permanently occupied as a weather and relief station for shipwrecked mariners, 10 persons having escaped from a wreck to remain on the island two years before rescue. Consult Sir Douglas Mawson, *Home of the Blizzard* (2 vols., Philadelphia, 1915).

McQUILLEN, John Hugh (1826–79). An American dentist. He was born in Philadelphia, practiced dentistry as early as 1849, and then studied medicine (M.D., Jefferson Medical College, 1852) and dentistry (D.D.S., Philadelphia College of Dental Surgery, 1853). From 1859 to 1862 he was professor of operative dentistry and dental physiology in the Pennsylvania College of Dental Surgery. In 1863 he founded the Philadelphia Dental College, becoming dean and professor of physiology, which offices he held until his death. He was one of the founders, and for many years president, of the American Dental Association. From 1859 to 1871 he edited and contributed many articles to the *Dental Cosmos*.

MACRAUCHENIA, mā′krą-kē′nĭ-ȧ (Neo-Lat., from Gk. *μακραύχην*, *makrauchēn*, long-necked, from *μακρός*, *makros*, long + *αὐχήν*, *auchēn*, neck). A fossil ungulate mammal of the size of a camel, found in the Pleistocene beds of Argentina. Although of a generalized type, it somewhat resembled the camels in respect of the length and structure of its neck. The muzzle was provided with a short proboscis. The feet were three-toed, with the toes about equal in size.

MACREADY, măk-rē′dĭ, William Charles (1793–1873). A noted English tragedian. He was born in London, March 3, 1793, the son of a provincial theatrical manager, and was educated at Rugby. He first played as Romeo at Birmingham in 1810 under his father's management. He continued with his father for four years; but in 1814 they quarreled and separated. For two years he played at Bath and other provincial towns. In 1816 he decided to try his fortune in London and appeared at Covent Garden as Orestes in *The Distressed Mother*. He met with moderate success and succeeded in winning the applause of Kean; but his progress was slow at first, owing largely to professional jealousies. In 1819 he made a hit in the character of Richard III and afterward adventured on others of Shakespeare's characters with success. In 1826 he made a tour of the United States and visited Paris in 1828. He became lessee of Covent Garden Theatre in 1837, and his management, though brief, was distinguished by the high character of his company and his productions. Later he managed Drury Lane for a time, but without pecuniary success. He visited America a second time in 1843–44; and again in 1848–49. On May 10, 1849, as a result of the jealousy of the American actor Edwin Forrest, a riot occurred at the Astor Place Opera House in New York from which Macready barely escaped with his life. On his return home Macready was engaged at the Haymarket, but his theatrical career was brought to a conclusion with his farewell benefit at Drury Lane, on Feb. 26, 1851. He died at Cheltenham on April 27, 1873. Macready was a fine and impressive player, and a conscientious student of his art. He succeeded best in the graver characters of the drama, having more of the stateliness of Kemble than of the fire of Kean. Consult his *Reminiscences, and Selections from his Diaries and Letters*, edited by Pollock (London and New York, 1875); Lady Pollock, *Macready as I Knew him* (London, 1884); Archer, *William Charles Macready* (ib., 1890); Baker, *English Actors from Shakespeare to Macready* (New York, 1879); Lewes, *On Actors and the Art of Acting* (ib., 1878); Marston, *Our Recent Actors* (London, 1890).

McREYNOLDS, m*a*k-rĕn′oldz, James Clark (1862–). An American lawyer, cabinet officer, and jurist, born at Elkton, Ky. He graduated from Vanderbilt University in 1882 and, in law, from the University of Virginia in 1884. He began the practice of his profession at Nashville, Tenn., where he attained such success and distinction that he was made professor of law at Vanderbilt in 1900. In addition to his professorial duties he continued his practice, particularly in the Federal courts, where his knowledge of corporation law attracted the attention of the Department of Justice. Although a Democrat, he was made Assistant Attorney-General of the United States in 1903 during the administration of President Roosevelt and served until 1907. Thereafter, as special Assistant Attorney-General, he was employed in many of the antitrust cases. His connection with the prosecution of the American Tobacco Company caused him to become widely known, for it was thought that he largely prepared the case for the government. In 1913 he was selected for the post of Attorney-General by President Wilson. This choice was particularly complimentary because of the difficulty of filling adequately the place of Attorney-General Wickersham and because the President announced that it was his especial aim to secure a great lawyer. As Attorney-General, McReynolds was perhaps most widely known as the one to enforce certain of the doctrines of the "new freedom," and, as such, he declared that, while he would insist upon strict compliance of the industrial combinations with the requirements of the law, he would welcome opportunities to adjust such questions without litigation, i.e., to effect a "settlement out of court." His effort was to promote genuine competition in big business. In enforcing the Sherman Anti-Trust Law, he had direction of the dissolution suits against the Union and Southern Pacific Railroad merger, the International Harvester Company, the American Telephone and Telegraph Company (settled out of court), the Reading Company, and the New York, New Haven, and Hartford Railroad. Although sharply criticized by some newspapers regarding the McNab-Caminetti controversy concerning delay in prosecuting a white-slave case, he was also warmly defended and his administration commended. In 1914 he was appointed to succeed Justice Harlan as an associate justice of the United States Supreme Court.

MACRI′NUS, M. Opelius (164–218 A.D.). A Roman Emperor. He was a native of Cæsarea in Mauretania and became pretorian prefect of Rome under Caracalla (q.v.), whom he caused to be assassinated on the expedition against Parthia in 217 A.D. He was at once chosen Emperor by the army, and the Senate confirmed the choice. He fought against the Parthians, neither side gaining a decisive victory, made terms with them, and returned to Antioch. His severe discipline aroused the anger of his soldiers, who were gained over by the relatives of Caracalla, and after a reign of 14 months he was defeated near Antioch and murdered in his flight. He was succeeded by Elagabulus (q.v.). Consult the article "M. Opellius Macrinus," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

MACRO′BIUS, Ambrosius Theodosius. A Latin grammarian of the late fourth and the early fifth century. He appears to have been by birth a Greek, but nothing whatever is known of his life. Two of his works remain, entitled *Commentarius ex Cicerone in Somnium Scipionis* and *Conviviorum Saturnaliorum Libri Septem*, commonly known as the *Saturnalia*. The former is the best known and was much read during the Middle Ages; it is a commentary on a dream of Scipio Africanus Minor dealing with the immortality of the soul, which is recorded in Cicero's *De Republica*. The latter is in the form of a dialogue, supposed to have been held at the house of Vettius Prætextatus (325–385 A.D.) during the Saturnalia, and contains many valuable historical, mythological, antiquarian, and critical observations. The author was deeply indebted to Aulus Gellius, both in matters of form and in contents. Books iii–vi deal largely with the criticism of Vergil—in particular with his learning in religious matters, his indebtedness to his Greek and Latin predecessors, especially Homer. Much of value is preserved to us from earlier writers through Macrobius' quotations. Of a third work, *De Differentiis et Societatibus Græci Latinique Verbi*, we possess only extracts made by one Joannes, thought to be Joannes Scotus Erigena, of the ninth century. The grammatical treatise is given in Keil, *Grammatici Latini*, vol. v (Leipzig, 1868). The *editio princeps* of Macrobius appeared at Venice in 1472; of later editions the best are those of Jan (2 vols., Quedlinburg, 1848–52) and Eyssenhardt (Leipzig, 1868, 1893). Consult: Georg Wissowa, *De Macrobii Saturnaliorum Fontibus* (Breslau, 1880); Linke, *Quæstiones de Macrobii Saturnaliorum Fontibus* (ib., 1888); W. S. Teuffel, *Geschichte der römischen Literatur*, vol. iii (6th ed., Leipzig, 1913).

MACROCOSM. See Microcosm and Macrocosm.

MACROCYSTIS, măk′rô-sĭs′tĭs. A genus of brown algæ whose species are commonly called giant kelps. They are particularly conspicuous along the Pacific coast of the United States. The stipe is firmly anchored by a holdfast, and the long ropelike stems float on the surface, bearing numerous leaflike blades. These floating stems are said to attain sometimes a length of 600 to 900 feet.

MACROGLOSSIA, măk′rô-glŏs′ĭ-ȧ. See Tongue.

MACROPOMA, măk′rȯ-pō′mȧ (Neo-Lat., from Gk. *μακρός, makros*, long + *πῶμα, pōma*, cover, lid). A fossil fish of the order Crossopterygii, found preserved in fine condition in the chalk beds of the English Cretaceous formations. The body was about 18 inches in length, of stocky form, and was covered with overlapping ganoid scales. The head was protected by rather heavy bones. The fins are simply lobate and consist of anterior and posterior dorsal, an anal, a pair each of pectoral and pelvic, and a broad caudal fin. The air bladder was ossified and is often found preserved in the better specimens. See GANOIDEI.

MAC′ROSPORAN′GIUM. An almost obsolete name for megasporangium (q.v.).

MAC′ROSPORE. An almost obsolete name for megaspore (q.v.).

MAC′ROSPOR′OPHYLL. An older and almost obsolete name for megasporophyll (q.v.).

MACROZA′MIA (Neo-Lat., from Gk. *μακρός, makros*, large + *ζαμία, zamia*, loss; so called because of the sterile appearance of the male fructification). A genus of Australian cycads, including about 14 species. The name means 'large *Zamia*,' a genus characteristic of the Occidental tropics. The stem ranges from tuberous and subterranean to more or less columnar and aërial. The fernlike leaves, as in other cycads, occur in a conspicuous crown or rosette at the summit of the stem.

MACRU′RA. See CRUSTACEA.

MACRURIDÆ. See MACRURUS.

MACRU′RUS (Neo-Lat., from Gk. *μακρός, makros*, long + *οὐρά, oura*, tail). The type genus of a family of fishes (Macruridæ) which are closely allied to the cods, seeming degenerate representatives of the stock and differing chiefly in the elongate and degenerate condition of the posterior part of the body, which tapers to the thin, much compressed tail. (See Plate of CODFISH AND ALLIES.) All are pelagic, and most of them inhabit the deeps and have the characteristics of deep-sea fishes. *Bathygadus* is another prominent genus. Consult Goode and Bean, *Oceanic Ichthyology* (Washington, 1896). See DEEP-SEA EXPLORATION.

McTAGGART, JOHN MCTAGGART ELLIS (1866–). An English philosopher, educated at Clifton College and at Trinity College, Cambridge, where he became a fellow in 1891 and lecturer in 1897. He was made a fellow of the British Academy and received an honorary LL.D. from St. Andrews. He published: *Studies in the Hegelian Dialectic* (1896); *Studies in Hegelian Cosmology* (1901); *Some Dogmas of Religion* (1906); *A Commentary on Hegel's Logic* (1910).

McTYEIRE, măk-târ′, HOLLAND NIMMONS (1824–89). An American bishop of the Methodist Episcopal Church South. He was born in Barnwell District, S. C., graduated from Randolph-Macon College, Va., in 1845, and entered the ministry, joining the Virginia conference. Later he became a member of the Alabama conference, and finally of the Louisiana conference. He was editor of the New Orleans *Christian Advocate* from 1851 to 1858, and then became editor of the *Christian Advocate* of Nashville, Tenn. The misfortunes of the Civil War having interrupted the publication of this paper, McTyeire was compelled to return to the pastorate and was stationed at Montgomery, Ala., during the war. He was a member of the General Conferences of 1854 and 1858; was one of the founders of Vanderbilt University; and, elected Bishop in 1866, was senior Bishop at the time of his death. He was author of *A Catechism of Bible History* (1869); *A Manual of Discipline of the Methodist Episcopal Church South* (1876); *A Catechism on Church Government, with Special Reference to the Methodist Episcopal Church South* (1878); *A History of Methodism* (1885); *Passing through the Gates, and Other Sermons* (1889); *Rules of Order for Deliberative Assemblies* (n. d.). Consult O. P. Fitzgerald, *Holland N. McTyeire* (Nashville, 1896).

MACÚ, mȧ-ko͞o′. One of the lowest tribes of the Amazon region, with no fixed residence, but wandering nearly the whole length of the Rio Negro, principally to the west of it, in northwestern Brazil. They are naked and without houses, but stitch a few palm leaves together to serve as a shelter at night in case of rain. They live entirely by hunting and fishing, using poisoned arrows, and are hostile to other tribes. Their hair is wavy and almost curly. They must not be confounded with the Maca (q.v.), or with the Maco of the Upper Orinoco. Consult Theodor Koch-Grünberg, in *Anthropos*, vol. i (Salzburg, 1906), and id., *Zwei Jahre unter den Indianern* (Berlin, 1909–10).

MAC′ULA (Lat., spot). A macule, spot, or stain, of limited area and circumscribed, without elevation or depression of surface. Maculæ is a term used in dermatology of not only macular diseases, but also some vesicular and papular affections, including nævus, ephelis, spilus, moles, etc.

MacVEAGH, măk-vā′, FRANKLIN (1837–). An American business man and cabinet officer, born near Phœnixville, Chester Co., Pa. He was educated by private tutors, at Freeland Seminary (now Ursinus College), and at Yale (A.B., 1862). He then entered Columbia Law School, from which he graduated in 1864. For a year he practiced law with his brother, Wayne MacVeagh, in Philadelphia; but finding his health failing he moved to Chicago, where he entered the wholesale grocery business with the firm of Whittaker and Harmon. Although the firm's property was destroyed by the great fire of 1871, MacVeagh was a tireless leader in the relief work and was warmly praised. Reorganized under the name of Franklin MacVeagh & Co., the corporation became one of the largest and most successful of its kind in the United States. MacVeagh also became interested in banking. In 1874 he may perhaps be said to have entered politics—as head of the Citizens' Association, an organization which investigated municipal conditions and the government and made recommendations regarding the elimination of certain grafting practices. In municipal matters MacVeagh acted with the Republican party, but later, with respect to national politics, he supported the candidacy of Cleveland in each of his campaigns. In 1894 he was nominated by the Democratic State Convention as candidate for United States Senator, but was defeated by the incumbent, Cullom. In 1896 he returned to the Republican party on the silver question. After the election of Taft in 1908 he was offered, and accepted, the post of Secretary of the Treasury, and he served throughout the administration. One of his first acts as Secretary was to order an inquiry to ascertain where economies might be effected. He was a promoter of the National Civic Federation, and was known as a man of wide attainments, being a member of various scientific and learned societies. Yale gave him the degree of LL.D. in 1912.

MacVEAGH, WAYNE (1833–1917). An American lawyer, diplomat, and cabinet officer, a brother of Franklin MacVeagh. He was born near Phœnixville, Chester Co., Pa., graduated at Yale in 1853, and after studying in the law office of James J. Lewis, of West Chester, was admitted to the Pennsylvania bar in 1856. He was a captain of infantry in 1862 and of cavalry in 1863, when invasions of Pennsylvania were threatened. From 1859 to 1864 he was district attorney of Chester County. He became prominent early as a Republican leader, fighting strongly against the machine in control, and in 1863 was chosen chairman of the State Committee. In 1870–71 he was United States Minister to Turkey, and in the latter year also led the fight in Pennsylvania Republican politics against Simon Cameron, his father-in-law, although remaining friendly in social associations. In 1877 he was chairman of the "MacVeagh Commission," sent unofficially by President Hayes to secure an amicable adjustment of the political differences in Louisiana. In March, 1881, he entered the cabinet of President Garfield as Attorney-General, but resigned on the accession of President Arthur and resumed his law practice. Under President Cleveland, whom he had supported in the campaign of 1892, MacVeagh was Ambassador to Italy. In 1896 he returned to the support of Republican candidates. Distinguished as a lawyer, in 1903 he was chief counsel for the United States in the Venezuela arbitration before The Hague Tribunal, and for many years he served as counsel for the Pennsylvania Railroad Company. He contributed to periodicals articles on international peace.

MacWHIRTER, măk-hwẽr′tẽr, JOHN (1839–1911). A Scottish landscape painter, born near Edinburgh. At 13 he ran away from home and became a pupil of Lander and Ballantyne in the art school of the Board of Manufacturers, Edinburgh. He exhibited at the Scottish Academy when only 15, and later traveled extensively in Europe and America, everywhere painting nature's gentler moods, and particularly excelling in masterful rendering of trees. His early work possesses charming color and graceful design, but his later paintings are often weak both in technique and sentiment. Among his finest landscapes are "The Lady of the Woods" (1876), "The Three Graces" (1878), "The Sleep that is among the Lonely Hills" (1896), "A Winter Fairy" (1898), "Over the Sea from Skye" (1900). He is represented in the Tate Gallery, London, and in the Liverpool and Birmingham galleries. In 1869 he took up his residence in London, and in 1877 made a visit to the United States, where he executed some notable studies of California scenery. He was elected a Royal Academician in 1894. In 1901 appeared his *Landscape Painting in Watercolors*. Consult W. M. Sinclair, "John McWhirter, His Life and Work," in *Art Annual* (London, 1903).

MACY, mā′sĭ, JESSE (1842–). An American historian, born in Henry Co., Ind. He graduated at Iowa (now Grinnell) College in 1870; the next year was appointed principal of the academy of the college, and in the college itself became professor of constitutional history and political science in 1885. Made professor emeritus in 1912, during the following year he visited French provincial universities as lecturer on the Harvard Foundation. Macy published: *Civil Government in Iowa* (1881); *Institutional Beginnings in a Western State* (1883); *Our Government* (1886); *The English Constitution* (1897); *Political Parties in the United States, 1846–61* (1900); *Party Organization and Machinery* (1904; new ed., 1912); *Political Science* (1913).

MADÁCH, mŏ′däch, IMRE (1823–64). An Hungarian poet, born of a noble family in the county of Nógrád. He studied law at Pest and became notary for his district. In 1861 he published a dramatic poem called *Az ember tragédiája* (The Tragedy of Man), which was considered the best of its kind that had appeared in Hungary. There are several German translations. Selections in English have appeared in vol. xvi of *The Library of the World's Best Literature*. His collected works were published by Paul Gyulai in 1880.

MAD′AGAS′CAR (corrupted from *Magadaxo;* formerly called by the natives *Izao rehetra Izao,* this whole, i.e., world, and *Ny anivon ny riaku,* [land] in the midst of the flood). A French colony, the sixth largest island in the world, being surpassed in area only by Australia, Greenland, New Guinea, Borneo, and Baffin Land. It is situated in the Indian Ocean off the southeast coast of Africa, from which it is separated by Mozambique Channel. It lies between lat. 11° 58′ and 25° 35′ S. and long. 43° 19′ and 50° 27′ E. It is 980 miles long and 358 miles in its greatest width, with an area (including the few adjacent islets) of 228,000 square miles (estimated), or about two and one-half times that of Great Britain (Map: Africa, J 6).

Topography and Geology. Madagascar may be divided into two distinct regions. The central and the eastern parts of the island, or more than half of it, are very mountainous and are formed of primitive rocks of igneous origin, except for a narrow fringe of sedimentary rocks along the coast. Gneiss, and particularly granitoid gneiss, predominates; there are also many granite dykes and, here and there, basalts, the cones of ancient volcanoes, magnetite and other iron ores, and numerous hot springs. The gneiss, decomposed to great depths, forms the reddish, clayey soil that covers most of these highlands. The volcanic centres (now extinct) of this region are Mount Ankaratra in the central region, the culminating summit of the island (nearly 9000 feet high), Mount Amber near the north end of the island, and Ivohitsombe near the southeast coast, north of Fort Dauphin. These highlands, the primitive land mass, rise from 3000 to 6000 feet above the sea.

The western and southern regions and a considerable district in the north are comparatively low, not much over 600 feet above sea level, and are built up of sedimentary rocks of Jurassic and Cretaceous periods, with some Eocene and Quaternary beds. Here also are many volcanic cones that have pierced through the sedimentary fossiliferous beds. The lowlands, broken by some ranges of hills extending north and south, rise gently to the central highlands, and the rivers have excavated numerous valleys, so that the west of the island is, for the most part, a deeply dissected plain. The coasts are in the main comparatively straight, with no deep indentations. The northwest coast, however, is broken up by great inlets, some of them landlocked, so that Mojanga and a few other bays are among the largest and finest of natural harbors. Elsewhere the island is poorly supplied with good ports for shipping.

Hydrography. Naturally, the rivers that are most important in an economic sense flow down the western slope across the plains to Mozambique Channel. The largest of these western rivers are the Betsiboka, the Tsiribihina, the Mangoka, and the Onilahy, all navigable for some distance by small vessels, and the Betsiboka for about 100 miles. The eastern rivers are torrential streams making their short course to the sea through gloomy but magnificent gorges under the shade of the densest forest growths. The largest of these rivers is the Mangoro. The only lake of importance is the Alaotra, among the mountains of the northeast. South of Tamatave, on the east coast, is a series of lagoons which the French have connected by 30 miles of canals, making an inland waterway about 100 miles long.

Climate. Owing to its geographical position and the considerable elevation of a large part of the island, Madagascar has both the temperate and tropical climates. The centre, with a mean elevation of about 4000 feet, has a temperate climate with a dry and wet season and a temperature rarely rising above 72° F. Here white men can best live and labor. The east has a warm and humid climate with rain nearly every day in the year, the precipitation at Tamatave, e.g., being over 90 inches in a year. The hot west coast has a dry season under the rain shadow of the mountains during the prevalence of the southeast trades and a wet season under the doldrums from November to April. All the coast regions are very unhealthful. The south of the island is marked by long periods of drought. Sometimes not a drop of rain falls in a year. The weather service has 42 stations.

Flora. The flora is very rich and varied; three-fourths of the species are endemic and there are almost 4000 indigenous species; but the rainfall dictates four botanical areas, in the east, west, centre, and south. The east, receiving the larger rainfall, has extensive forests of tropical timber, including many valuable species. A large part of the centre, on the contrary, being comparatively dry, is almost destitute of vegetation. It is only around the villages and along the rivers that trees and cultivated lands are found. The reason is that the moisture-laden winds from the Indian Ocean part with their water vapor on the eastern slopes of the mountains and west of the crests there is much smaller rainfall. In the west are found large expanses of prairies adapted for extensive cattle raising, with here and there clumps of timber and isolated trees. A belt of forest parallels the west coast at some distance from it, but it is by no means so luxuriant as the eastern forests. Cacti and euphorbias are found in the dry south, where the botanical aspects of the country resemble those of the dry plateaus of Mexico.

Fauna. See MALAGASY SUBREGION.

Progress of Geographical Knowledge. When General Gallieni conquered the island in 1896 he said the first duty of the French was to study their new possession. The progress of field surveys and exploration under his direction was remarkable. The military detachments that visited all parts of the island in the work of pacification were accompanied by topographers, whose map results have been compiled in a large map on a scale of about 8 miles to an inch. Many parts of the island are now mapped on a scale of about 1½ miles to an inch, and the capital and its surroundings on a scale of about ⅝ mile to an inch. All mountain ranges, streams, town roads, trails, mission stations, and much other information are shown on the maps.

Resources. Cattle raising is important; notwithstanding primitive native methods, the natural conditions are so favorable that the herds show great increase from year to year, as evidenced by the annual live-stock census (taken on account of the tax levied), which showed 2,342,792 cattle in 1904, 3,812,671 in 1908, 4,492,131 in 1910, and 5,320,200 in 1913. These figures are exclusive of calves and of the great herds running wild in the western regions. Rice is the principal cultivated crop, and extended in 1914 over 396,130 hectares. From 1901 imports of this staple have decreased annually, until in 1912 there was an export of 7420 tons, valued at 1,675,773 francs. In 1901 the import was valued as 5,640,636 francs. Other agricultural products are manioc, corn, peas, vanilla, coffee, etc. The forests yield ebony, rubber, and wax. From the mines come gold, silver, iron, copper, lead, and zinc.

Commerce. In the over-sea trade, the imports for consumption in 1912 were valued as 50,034,848 francs (40,470,813 francs in 1900), detailed in part as follows: cotton textiles, 22,768,330 francs; metal manufacturers, 4,759,193; metals, 1,703,119; wines, 1,950,643; spirits, 995,391. The total exports of domestic products in 1912 were valued at 59,844,294 francs (10,623,869 in 1900): raw hides, 10,752,572 francs; raw gold, 5,989,175; rubber, 5,181,431; vanilla, 3,941,521; raffia, 3,787,936; legumes, 2,807,575; wax, 1,696,760; cattle, 1,008,685; ebony, 425,000. In the total trade France contributed imports valued as 47,541,971 francs and received exports valued as 49,417,553 francs. There were entered at the ports (the chief ports are Tamatave, Majunga, and Diego-Suarez, qq.v.) in the 1912 foreign trade 10,937 vessels, of 1,756,764 aggregate tons.

Communications. A railway completed early in 1913 unites the capital with Tamatave, a distance of 369 kilometers. A law passed Dec. 31, 1912, authorized the construction of a line from the capital to Antsirabe. The existence of roads is contemporaneous with the French occupation of the island. At great cost and in the face of extraordinary obstacles the department of public works has established the following main routes, traversed by regular automobile service: the Eastern, Western, and Southern, the Antananarivo-Miarinarivo, the Fianarantsoa-Mananjary, and the Mangoro-Lake Alaotra routes.

Administration. The colony of Madagascar is divided for purposes of administration into 21 provinces, the commune of Sainte-Marie, and the autonomous districts of Ankazobe and Ambilobe, administered by residents and vice residents under the direction of a governor-general. By the decree of March 31, 1914, the Comoro Islands dependency was created a province of Madagascar. The first resident general arrived at Antananarivo Jan. 16, 1896, and the law declaring Madagascar and its dependencies a French colony was passed Aug. 6, 1896. The decree of July 31, 1897, created General Gallieni, resident general from Sept. 28, 1896, governor-general of Madagascar and its dependencies.

Slavery was abolished by the decree of Sept. 27, 1896, and the system of enforced native labor has since been abolished. The troops stationed at Madagascar include two battalions of colonial infantry, a regiment of colonial artillery, three regiments of Malagasy *tirailleurs*, one battalion of Senegalese *tirailleurs*, and two companies of noncombatants. The budget for 1911 balanced at 31,153,000 francs; the debt stood, Jan. 1, 1912, at 98,220,000 francs. The government maintained, at the end of 1913, 609 elementary native schools in which both the French language and the Hova dialect were taught, eight regional continuation schools, four special and two high schools. There are primary and secondary schools for Europeans. There are courts of justice and of appeal for Europeans, and native tribunals for aboriginals.

Population. The population according to the census of 1911 was 3,104,881; with dependencies, 3,154,000. As calculated Jan. 1, 1914, the inhabitants of the island numbered 3,253,581 (3,351,481 with dependencies), as follows: 14,918 whites, 12,905 Asiatics, 3,225,758 aboriginals. Antananarivo (Tananarive), the capital, has about 72,000 inhabitants.

Ethnology. The generic term for the natives of Madagascar is Malagasy. Of their three principal tribes, the Hovas are Indonesians, more or less mixed with Malay. They are supposed to be the last wave of the Malay migration, coming about eight centuries ago. They have straight black hair and olive-yellow skin; their eyes are sometimes narrow; their stature is short, their noses prominent and sharp; their head is globular. Agriculture, cattle raising, and trading are their occupations. Their principal food is rice, which is cultivated with the aid of artificial irrigation, recalling the terrace system of the Philippines. Many other customs and arts pointing to their ancestral home are preserved, as the square pile house, bellows, outrigger canoe, musical instruments, dress, taboo, infanticide, ordeal, burial, and the like. The Hovas were until recently the ruling people on the island and were gradually subjecting the other tribes, to which they are much superior in culture. They were divided into nobles, freemen, and slaves. In recent years, however, these class distinctions became weaker and the royal and slave classes were finally abolished by the French. They are nominally Protestants in religion. In practice pagan taboos and a system of divination with 16 as the mystic number play a great part. The latter is almost certainly derived from Arabic geomancy. The principal tribes of the Hovas are the Voromahevy, Tsimianboholahy, Tsinahafoty, Mandiavato, Marovatana, and others. The Betsileos living to the south should also be placed with the Hovas.

The Betsimisarakas are less pure than the Hovas and are dolichocephalic; they are below the average height and have curly or almost smooth hair and light chestnut complexion. They are rather backward in culture and show influences due to the Arabs who settled in Madagascar about five centuries ago. The principal tribes are the Antambahoaka, Antaimoro, Antaifasina, Antaisaka, Antaisara, Antanosi, Tanala, and Sihanaka. They were conquered by the Hovas early in the nineteenth century.

The Sakalavas are dark, long-headed, and of high stature; their hair is frizzly, their lips thick, and their noses flat. Most strongly of all the Madagascar tribes they show the negro element. The best-known tribes are the Menabe, Milaka, Ronondra, and Mahafali.

History. Madagascar appears on Arabian charts of the twelfth century and it is probable that Arab traders visited the country as early as the eighth or ninth century. Marco Polo used the name *Madeigascar*, but apparently applied it to what is now Mozambique, on the mainland of Africa. The discovery of the island by the Portuguese occurred in 1500, when, according to Grandidier and Reclus, Diego Diaz sighted the land and named it São Lourenço. Attempts at settlement made before 1540 by the Dutch, English, and Portuguese failed, but in the seventeenth century the French set up a claim to Madagascar, or Dauphiné, as they called it, and in 1642 Louis XIV granted it to the Compagnie de l'Orient. Stations were established at Sainte-Marie and Fort Dauphin, but the rule of the French was so cruel that the natives rose in 1672 and massacred them. France regained Sainte-Marie in 1750, lost it to Great Britain during the Napoleonic wars (1814), and reoccupied it after 1815, together with Tamatave, Fort Dauphin, and Sainte-Luce. French influence, however, made little progress owing to the rise of the powerful monarchy of the Hovas, a people of the central plateau, who, under the leadership of Andriananimpoina, had subjugated the greater part of the island. During the reign of Radama I (1810–28) the British gained the ascendancy. English officers drilled the Hova troops and English missionaries introduced schools and the Christian religion. Under Queen Rànavàlona I (1829–61) a strong reaction from European ideas occurred. Reforms were abolished, the missionaries were persecuted, and trade relations with England were broken off. Christianity was declared illegal in 1835. An unsuccessful attack on Tamatave by the English and French in 1845 led to a general massacre of Christian converts (Malagasy). After 1853, however, the Europeans regained an entrance into the capital, Antananarivo, through the influence of Prince Rakoto, heir to the throne. As Radama II (1861) Rakoto showed himself friendly to the French, and undertook to restore the reforms of Radama I. He was murdered by the conservative faction at court. Though Queen Rànavàlona II adopted Christianity in 1869, the Hova government remained jealous of European aggression and took measures to prevent the foreign acquisition of land in the island. In 1883 the invasion of French territory and the plundering of French citizens led to the bombardment of Tamatave. After two years' desultory fighting Madagascar, by treaty, became virtually a protectorate of France, though it retained its nominal independence. Renewed hostility on the part of the Hovas was followed in 1895 by the dispatch of a French expedition under Duchesne, which occupied Antananarivo and forced Queen Rànavàlona III to confirm the Treaty of 1885. In 1896 Madagascar was declared a colony of France, though the native government was retained, and a proclamation was issued abolishing slavery. The same year the outbreak of a rebellion in which the court was found concerned led to the deposition of the Queen and the institution of a military government. The former Queen was exiled to Réunion, and afterward to Algeria. In 1907 almost all the native churches on the island were abolished. Governor Albert Picquié (appointed 1910) has paid particular attention to internal improvements, and the resources of the country are rapidly being opened up.

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MADAGASCAR (in zoögeography). See Malagasy Subregion.

MADAGASCAR CAT. A lemur (q.v.).

MADAMA (mä′dȧ-mä) **BUTTERFLY.** An opera by Puccini (q.v.), first produced in Milan, Feb. 17, 1904; in the United States, Nov. 12, 1906 (New York).

MADAME BOVARY, mȧ′dȧm′ bō′vȧ′rē′. The most notable romance of Gustave Flaubert.

MADAME CHRYSANTHÈME, krē′zäN′tĕm′. A romance by Pierre Loti (1887).

MADAME SANS-GÊNE, säN′zhân′. A play and an opera. The play, by Sardou and Moreau, was first produced at the Vaudeville, Paris, in 1893. The personages are Napoleon I and the homely characters whom he made his courtiers. The opera, by Umberto Giordano (q.v.), was first produced at the Metropolitan Opera House, New York, Jan. 25, 1915.

MAD′AN, Falconer (1851–). An English author and librarian, born at Cam, Gloucestershire. He was educated at Marlborough (1864–70) and at Brazenose College, Oxford, where he was scholar from 1870 to 1875 and fellow from 1876 to 1880. From 1880 to 1912 he was sublibrarian of the Bodleian Library and thereafter librarian, and over a long period (1889–1913) he held the university lectureship in paleography. His writings are chiefly included in: *Books in Manuscript* (1893); *Summary Catalogue of Bodleian MSS.*, vols. iii–vi (1895–1906); *Oxford Books, 1468–1650* (2 vols., 1895–1911); *The Gresleys of Drakelowe* (1899); *Chart of Oxford Printing* (1903–04); *Account of the Oxford University Press* (1908).

MAD′AN, Martin (1726–90). An English writer. His father, a colonel, was a member of Parliament and his mother was an aunt of the poet Cowper. From Westminster School he passed to Christ Church, Oxford, where he graduated B.A. in 1746. In 1748 he was called to the bar. Impressed by Wesley's preaching, he gave up his profession, and, with the aid of Lady Huntington, who had turned Methodist, he was admitted to holy orders. He was appointed chaplain to the Lock Hospital in London, where he became widely known. In 1780 he published *Thelyphthora*, a book in which it was argued that polygamy is in accord with the Mosaic law and with Christianity rightly understood. The work created a sensation. Madan resigned his chaplaincy and retired to Epsom, where he died May 2, 1790. Besides the famous *Thelyphthora*, Madan published a score of other books and pamphlets, including several on polygamy, translations of Juvenal and Perseus (both in one volume, 1789), and a collection of psalms and hymns.

MAD ANTHONY. A nickname given to Major General Anthony Wayne because of his reckless daring in the American Revolution.

MAD APPLE. See Sodom, Apple of.

MAD CAVALIER. A name given to Prince Rupert of Bavaria, nephew of Charles I of England.

MADDALONI, mäd′dȧ-lō′nē. A city and railway centre in the Province of Caserta, Italy, 4 miles southeast of Caserta. It is situated in a finely irrigated and fertile district. The palace of the Caraffa family and the church of San Michele stand on a height above the city. In the vicinity is the famous Caroline aqueduct, which supplies Caserta with water. The principal industries are quarrying, weaving, and pottery manufacture. Pop. (commune), 1901, 20,682; 1911, 19,784.

MAD′DEN, Sir Frederick (1801–73). An English antiquary, born in Portsmouth. He entered the service of the British Museum in 1826 as a cataloguer, two years later was made assistant keeper of the department of manuscripts, and in 1837 keeper. In 1834 he was gazetted one of the gentlemen of the privy chamber. The foremost paleographer of his time, he continued to hold his post in the British Museum until 1866, when he retired, devoting the remainder of his life to antiquarian and literary study. He edited the metrical romance of *Havelok the Dane* (1833); *Layamon's Brut, or Chronicle of Britain* (1847); Wiclif's *Bible* (1850); Matthew Paris's *Historia Anglorum* (1866–69).

MADDEN, Richard Robert (1798–1886). A British traveler and author, born in Dublin. In 1833 he was sent to Jamaica as one of the special magistrates to administer the Emancipation Act; in 1836 was appointed a judge in the Mixed Court at Havana; and in 1841 served as a member of the inquiry commission to report on slave-trade conditions on the African west coast. From 1843 to 1846 he was Lisbon correspondent of the London *Morning Chronicle*, in 1847 was Colonial Secretary of Western Australia, and from 1850 to 1880 was secretary of the Loan Fund Board of Dublin Castle. A physician by profession, trained in Paris, Naples, and London, in 1855 he was made a fellow of the Royal College of Surgeons, London. His chief works are *The United Irishmen: Their Lives and Times* (1843–46; new ed., 12 vols., New York, 1910) and *The History of Irish Periodical Literature* (1867).

MAD′DER (AS. *mædere, mæddre*, Icel. *maþra*, madder), *Rubia*. A genus of plants of the natural order Rubiaceæ, very nearly allied to the genus *Galium* or bedstraw (q.v.), and differing from it chiefly in having a juicy fruit resembling two small berries growing together. The species are found in the tropical and warmer temperate parts, both of the Old and the New World, and are important for the coloring matter of their roots. The most important is the common madder or dyer's madder (*Rubia tinctorum*), a native, probably, of the south of Europe as well as of Asia and now cultivated in most European countries and also in the East Indies, China, etc. It is a perennial, with weak stems and whorls of 4–6 elliptic or lanceolate glossy leaves, the stem and leaves rough with sharp prickles; small greenish-yellow flowers, and black fruit. The Turkish madder (*Lizari* or *Alizari*) was probably the earliest in use, but the limited amount imported to the United States is principally from Holland. In the Levant the plants are plucked when five or six years old, but in Europe they are allowed to grow only two or three years. The best quality, known as *crop madder*, is that which is freed from the brown outer crust before grinding. *Mull madder*, the most impure variety, is obtained by grinding rootlets, the woody parts of the root, brown outer crust, and all. From the madder roots are prepared, by fermentation and filtration of the separated dye colors, the commercial products known as garancine, flowers of madder, commercial alizarin, and madder extracts. Madder extracts consist of mixtures of the two coloring mattes of madder, alizarin and purpurin. The importance of madder and madder preparations has almost entirely disappeared with the development of the artificial manufacture of alizarin. Consult S. P. Sadtler, *Industrial Organic Chemistry* (4th ed., Philadelphia, 1912), and Sir T. E. Thorpe, *Dictionary of Applied Chemistry* (rev. and enl. ed., London, 1912). See Alizarin.

MADDER, Indian. See Chay Root.

MADDER FAMILY. A popular name for a family of plants. See Rubiaceæ.

MADDER LAKE. See Paints; Lakes.

MAD′DERN, Minnie. An American actress. See Fiske, Minnie Maddern.

MADEIRA, mȧ-dē′rȧ, *Portug. pron.* mȧ-dā′rȧ. The chief of the Madeira Islands, in the Atlantic Ocean, about 400 miles west of Morocco, just south of the parallel of lat. 33° N. (Map: Portugal, E 5). It is about 38 miles long and 12 miles broad, and has an area of about 300 square miles. Its surface is rough and diversified with high peaks and deep valleys; it is traversed by a ridge of mountains, attaining in Pico Ruivo an altitude of 6568 feet above the sea. Their average height is estimated at 4000 feet, and the more elevated peaks are often covered with snow. Madeira is of volcanic origin, and although it has no active volcanoes at present, there are numerous traces of lava streams. The scenery is magnificent, the deep valley known as the Curral das Freiras being especially picturesque. The coasts are generally high, with precipitous, rocky cliffs, reaching in Cabo Girao a sheer height of 1934 feet. The climate of Madeira is remarkable for its uniformity and salubrity, and the island is regarded as one of the best of health resorts and much recommended to sufferers from chest complaints. The average temperature at the coast for the year is about 68° F., that of the coldest month being about 60° F., and that of the warmest 73° F. The island is, however, exposed to the deadly leste (east wind), or hot sand storm from the Sahara Desert. The absence of rain during the summer, under the sway of the horse latitudes, necessitates a complete system of irrigation. The water is stored up during the rainy season on the hills and distributed in the summer by means of channels. The vegetation of Madeira is one of the richest and includes more than 80 species of plants peculiar to the island. In addition to European grains and fruits, there is an abundance of bananas, figs, grapes, apricots, custard apples, mangoes, oranges, pineapples, and citrons. The fauna is less varied; there are no indigenous mammals and no snakes, though lizards and turtles are found. Birds, however, are very numerous and are characterized by a remarkably bright plumage. The most common species is the wild canary. The wine industry, which was introduced from Crete in the sixteenth century and for which the island is famous, is still very extensive, the annual export amounting to about 700,000 gallons, although it has considerably declined since the grape disease of 1851–52. Besides wine the island produces sugar, tobacco, and coffee. Among the other industries may be mentioned lace weaving, wood carving, and the manufacture of cigars. In 1900 the district of Funchal had a population of 150,574, of whom 148,263 were in Madeira; in 1911 (census of December 1), 169,783, of whom 167,601 in Madeira. Males, 73,637; females, 87,964; illiterate, 67,058 males, 71,596 females; able to read, 12,579 males, 16,368 females. The people are of Portuguese descent, with some Moorish and negro intermixture. The population of Funchal (q.v.), the capital of the district, was 20,844 in 1900 and 24,687 in 1911. The dominant religion is Roman Catholic, but the Church of England and the Free church of Scotland are also represented. The island is connected by steamship lines with the United States, Great Britain, France, Belgium, Portugal, and the not distant Canary Islands. Madeira is supposed to have been known to the Phœnicians in ancient times. It was rediscovered by the Portuguese explorer João Gonçalvez Zarco in 1419 and colonized about 30 years later. In 1580 the island fell into the hands of the Spaniards, but was restored to the Portuguese in 1640. In 1801 and from 1807 to 1814 Madeira was occupied by the British, but since then it has remained in the possession of Portugal. For bibliography, see Madeira Islands.

MADEIRA. The principal tributary of the Amazon (Map: Brazil, E 5). It is formed on the boundary between Bolivia and Brazil by the union of the Mamoré and the Beni and flows northeastward with numerous windings, forming in a part of its course the boundary between the Brazilian states of Matto Grosso and Amazonas. It enters the Amazon about 50 miles below the mouth of the Rio Negro after a course of about 900 miles from the confluence of its head streams, and about 2200 miles from the remotest source of the Mamoré. For the first 200 miles below the junction the Madeira flows through rocky gorges in a series of falls and rapids ending in the Falls of São Antonio, 715 miles from its mouth. Below this point it is a majestic river nearly a mile wide, and navigable for ocean steamers during nine months of the year, and for steamers drawing 8 feet at all seasons. A railroad past the falls, from São Antonio to the union of the Mamoré and Guaporé, is in the course of construction and will aid in the development of the State of Matto Grosso and parts of Bolivia. The vast forest region through which the river flows is almost wholly undeveloped, to a large extent unexplored, and almost uninhabited, save by tribes of Indians and by rubber gatherers, who have made a number of settlements along the banks, this being one of the chief rubber-producing regions in the world. The name Madeira, which means 'timber,' was given to the river on account of the great quantities of driftwood sent down by the current. The Madeira was explored, and its principal tributary, the Rio Teodoro (q.v.), formerly the Rio Dúvida (River of Doubt), was put on the map by the Roosevelt-Rondon scientific expedition in 1914.

MADEIRA ISLANDS. A group of islands in the Atlantic Ocean, west of Morocco, forming a province of Portugal, under the name of Funchal (Map: Portugal, E 5). It consists of the island of Madeira, the small neighboring island of Porto Santo, and the islet of Deserta Grande, the last of which, together with a number of mere rocks hardly worthy of the name of islands, is uninhabited. The area of the group is 315 square miles, of which about 300 square miles are included in Madeira. The population is almost wholly confined to the island of Madeira (q.v.).

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MADEIRA NUT (Portug., wood). The Persian or English walnut. See Walnut.

MADELEINE, mȧd′lân′, La. A noted church in Paris, on the square of the same name. The work was intrusted to the architect Coutant d'Ivry, and the foundation was laid by Louis XV in 1764. Upon the death of Coutant d'Ivry, in 1777, his successor, Couture, changed the design and substituted the present plan. Work on the edifice was suspended at the Revolution, and Napoleon in 1807 employed the architect Vignon to convert it into a Temple of Glory. The original name was resumed in 1816, and, after an interruption due to the revolution of 1830, the work was completed in 1832 by Huvé, at a cost of $3,000,000. The church has the form of a Roman Corinthian temple surrounded by columns, 16 of which form the south portico. It stands on a basement 23 feet high and is 354 feet in length, 141 in breadth, and 100 feet high. The tympanum of the south façade is filled with a relief by Lemaire, representing Christ as the judge of the world. The bronze doors, 34½ feet high and 16 feet broad, are by Triqueti. The interior departs from Roman prototypes in having three bays covered by pendentive domes, but each of these has an opening or *oculus* at the summit, in imitation of the Pantheon at Rome, and the interior details of columns and altars in style resemble those of the Pantheon. There are no windows. On the ceiling of the choir is a fresco by Ziegler, the "History of Christianity." The church contains a number of large paintings and sculptures. The high altar, by Marochetti, represents Mary Magdalene borne to Paradise by two angels.

MADELEINE, La. A prehistoric station near Tursac, in the valley of the Vézère, Dordogne, France, from which the Magdalenian epoch was named. See Paleolithic Period.

MADELEINE, Marie Angélique de Sainte. A prioress of Port Royal, celebrated in connection with the Jansenist controversy. See Arnauld, Jacqueline Marie.

MADEMOISELLE, mȧ′de-mwä′zĕl′. A local name about Pensacola for the fish yellowtail (q.v.).

MADEMOISELLE DE LA SEIGLIÈRE, de lȧ sâ′glyâr′. A romance by Jules Sandeau (1848), dealing with the relations between an émigré noble, the Marquis de la Seiglière, and his former tenant, Stamply. A comedy based on it was presented in 1851.

MADEMOISELLE DE MAUPIN, mô′păN′. A novel by Théophile Gautier (1835).

MADERNA, mȧ-dĕr′nȧ, Carlo (1556–1629). An Italian architect, born at Bissone near Como. As a youth, he assisted his uncle, Domenico Fontana the architect, in his work, and soon became widely known, receiving the patronage of Popes Clement VIII and Paul V. Under Paul he was appointed architect of St. Peter's, which he completed after his own designs. The Greek cross, which had been Michelangelo's plan, was altered to a Latin cross, lengthening the edifice and thereby destroying much of its harmony. The new vestibule or narthex added by Maderna is a noble design internally, but the east façade with which he fronted it is an utterly tame and inconsequential work. His portion of the work was finished in 1612; the colonnades on the Piazza in front were added by Bernini. Maderna also erected the two great fountains of St. Peter's. He grew in fame and fortune and designed churches and palaces in Spain and France as well as in other parts of Italy, but did his best work in Rome. Among various notable edifices by him in that city are the church of S. Maria della Vittoria, the Palazzo Mattei (1602), the Palazzo Odescalchi, the continuation of the Palazzo Quirinale, and the

Palazzo Barberini (completed by Bernini and Borromini).

MADERO, mȧ-dā′rō, Francisco (1873–1913). President of Mexico, born at San Pedro, Coahuila. He was a member of the large and wealthy Madero family and was well educated, liberal, and an idealist. He spent his early manhood in developing the agricultural and mineral resources of paternal estates and in the banking business. Going to Mexico City in 1900, he began to take more notice of the political situation of the country, but his real interest in politics was awakened by the election massacres at Monterey in 1903. At this time he took up the cause of the independent voters, forming the Club Democratico Benito Juarez and introducing American methods into politics. This made him the acknowledged leader of the independent voters by 1905. Opposed to the reëlection of Díaz to the presidency, in 1908 he published a book entitled *La Sucesión Presidencial en 1910*, which created a profound sensation. In the volume, while giving praise to the achievements of Díaz, he made an open attack and criticism of the then existing régime, doing so, however, in a spirit of fairness and justice. He discussed militarism and absolutism as established under Díaz, portrayed the existing evils in the social and political system, and attacked the policy of coercion in elections. His programme was "liberty of suffrage" and "no reëlection." The book was immediately suppressed and its circulation prohibited. This open attack on the administration showed Madero to be the only man who was able to run against Díaz in the election of 1910. He was nominated by the National Democratic or antireëlectionist party and proceeded to carry on a vigorous campaign in all parts of the country. The Díaz administration, fearing the consequences of such political agitation against itself, soon suppressed Madero's activity by securing his arrest at Monterey on wholly unsubstantiated charges (June 27, 1910). Having been kept in jail long enough to destroy all possible chances in the election, he was released on bail, which he forfeited. Convinced that legal methods were useless for securing reform, Madero issued the Plan of San Luis Potosí on Oct. 15, 1910. This plan demanded effective suffrage and no reëlection. It called for reforms in the distribution of land, the free restitution of the lands wrested from the Indian tribes, the liberation of all political prisoners, the abolition of the military practice of making soldiers out of condemned prisoners, and positive guaranties of the right of free speech and free press. "Take up arms, my people, drive the despots from power, recover your rights of free men," was the concluding appeal for an uprising which was set for November 29. The plot having been discovered, Madero fled to the United States, and his followers began the revolt at Puebla on November 20. Madero soon returned and took charge of the campaign, which, beginning in Chihuahua, spread at once to Sonora and Sinaloa. The successful campaign was ended by the capture of Juarez, where Madero established his capital and appointed a cabinet on May 11, 1911. Recognizing the hopelessness of the situation, Díaz entered into negotiations with the insurgents, and peace was signed on May 21. On June 7 Madero entered Mexico City. Declining the provisional presidency, he was nominated by the Progressive party and unanimously elected to the presidency on October 1. His administration was immediately beset by many difficulties. The old Congress, which he recognized, pursued a policy of obstruction, and the *Cientifico* press waged a relentless campaign against him. In 1912 revolts occurred—in the south under Zapata, in the north under Orozco, who captured Juarez, and at Vera Cruz under the leadership of Felix Díaz, the nephew of the exiled president. Under Madero's direction began the work of reform which included the rescinding of monopolistic concessions, the encouragement of labor unions, the refusal of government aid to capitalists against strikers, and the enactment of a minimum-wage law for textile workers. He was unable, however, to crush out insurrection effectively or to secure the constitutional liberties and land reforms for the oppressed peons. He neither commanded the respect nor bought the support of the army and laid himself open to charges of nepotism. On Feb. 9, 1913, a new revolt against Madero took place in Mexico City, led by General Bernardo Reyes and Felix Díaz. Bloody street fighting and bombardment of various buildings took place within the city for 10 days, at the end of which time Victoriano Huerta (q.v.) deserted Madero and caused his overthrow. Madero and the vice president Pino Suarez were arrested and forced to resign (February 19). Four days later they were both murdered, while being transferred from one prison to another, under circumstances which have never been fully explained, though it is commonly supposed that Huerta was responsible for their deaths. Huerta himself, on a visit to the United States in 1915, denied that he was responsible, but declined to incriminate anyone else. See Mexico, *History*.

MĀDHAVA, mäd′hȧ-vȧ, **MĀDHAVĀCHARYA**, mäd′hȧ-vȧ-chä′ryȧ. An eminent Hindu scholar, royal counselor, and divine, who lived in the fourteenth century of our era. He was elder brother of the famous Vedic commentator Sāyana (q.v.) and flourished under King Bukka I (1350–79 a.d.), whom he served as Prime Minister and spiritual adviser. This ruler belonged to the dynasty of Vijaya-nagara (city of victory), now Hampi, in the District of Bellary, south Central India, which is said to have been Mādhava's birthplace. He was associated with the monastery of Sringiri, of which he became abbot. The list of his works on philosophical, religious, and technical subjects is a long one. Consult Klemm, "Mādhava, seine Lehre und seine Werke," in the *Gurupūjākaumudī, Festgabe zum Doctorjubiläum Albrecht Weber* (Leipzig, 1896). The name Mādhava is frequently found earlier in Sanskrit literature and Hindu mythology as an appellation of the god Vishnu (q.v.) or his incarnation, Krishna.

MADHUCA, mä′dụ-kȧ. A tropical tree. See Butter Tree.

MA′DIA (Neo-Lat., from *madi*, the Chilean name), *Madia*. A genus of annual upright plants of the family Compositæ. The yellow ray flowers are shortly ligulate, those of the disk tubular; the seeds without pappus but very viscid, rich in oil, which is expressed. *Madia sativa*, which attains a height of 3 to 5 feet, is cultivated under the names madi or melosa in Chile, where it is native and from whence, early in the nineteenth century, it was taken to Europe, where it has been cultivated to some extent since 1839 as an oil plant. Madia oil is richer than poppy oil, almost entirely inodorous, of a bland, agreeable taste, and very suitable for oiling machines, as it does not solidify even at 10° F. The oil cake is a good food for cattle. The flowers ripen gradually in succession, so that they first ripen their seeds which fall off before the last flowers open—a great disadvantage in a crop. Another species, *Madia elegans*, is cultivated in flower gardens. A number of species of Madia are found in the Pacific Coast States from Washington southward, where they are known as tarweeds.

MAD'ISON. A village in Madison Co., Ill., 1 mile northeast of St. Louis, Mo. (Map: Illinois, D 8). Situated at the end of Merchant's Bridge, Madison is on 11 railroad lines. Car shops, steel mills, barrel works, a tie-preserving plant, rolling mills, lead works, and paving-material factories constitute the principal industrial plants. Pop., 1900, 1979; 1910, 5046.

MADISON. A city and the county seat of Jefferson Co., Ind., 86 miles southeast of Indianapolis, on the Ohio River and on the Pittsburgh, Cincinnati, Chicago, and St. Louis Railroad (Map: Indiana, G 7). It contains the Southeastern Indiana Hospital for Insane. The city has steamboat connection with important places on the river and carries on a large shipping trade, particularly in loose leaf tobacco. There are a marine railway and shipyards, ship-lumber yards, foundries and machine shops, tanneries, saw and flour mills, cotton and woolen mills, a brewery, a furniture factory, wagon shops, etc. Madison was founded in 1808, first incorporated in 1824, and received its charter as a city in 1836. The water works are owned by the municipality. Pop., 1900, 7835; 1910, 6934.

MADISON. A town in Somerset Co., Me., 27 miles by rail north of Waterville, on the Kennebec River, and on the Maine Central Railroad (Map: Maine, C 4). It contains a Carnegie library, and, among its industrial establishments, woolen, pulp, and paper. By means of two dams on the river at this place abundant water power is obtained. The electric-light plant is owned by the village corporation. Pop., 1900, 2764; 1910, 3379. Madison was first settled about 1730. At Old Point, near here, came the end of the Norridgewock Indian tribe, with the assassination of Father Rasle, in 1724. A monument has been erected to his memory. The town was incorporated in 1804.

MADISON. A borough in Morris Co., N. J., 26 miles by rail west of New York City, on the Lackawanna Railroad (Map: New Jersey, D 2). It is the seat of Drew Theological Seminary (q.v.), is popular as a suburb for Newark and New York business men, and has a public library and a fine public park, the latter having been improved at an expense of $200,000. The only important industry is that of flower culture, rose growing being the chief specialty. Madison was settled before the Revolution and was incorporated as a borough in 1889. The government is vested in a mayor, chosen biennially, and a council, elected on a general ticket. The borough owns and operates the water works and electric-light plant. Pop., 1900, 3754; 1910, 4658.

MADISON. A city and the county seat of Lake Co., S. Dak., 40 miles by rail northwest of Sioux Falls, on the Chicago, Milwaukee, and St. Paul Railroad (Map: South Dakota, G 3). It is in a picturesque lake region popular as a summer resort, is the seat of a State normal school, and contains a Carnegie library. Madison is in a farming and stock-raising district, from which it derives considerable trade, and there are several grain elevators, marble works, a flour mill, a gasoline-engine factory, and a large creamery. The water works and electric-light plant are owned by the municipality. Madison has adopted the commission form of government. Pop., 1900, 2550; 1910, 3137.

MADISON. A city, the capital of Wisconsin, and the county seat of Dane County, 82 miles by rail west of Milwaukee, on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Illinois Central railroads (Map: Wisconsin, D 5). A widely noted educational and summer resort, it lies in the attractive lake country (at an elevation of 860 feet above the sea and 210 feet above Lake Michigan), between Lakes Mendota, Monona, and Wingra, and near Lakes Waubesa and Kegonsa. A system of beautiful parked suburban drives, carefully macadamized and nearly 30 miles in length, is maintained by popular subscription. There are also several beautiful parks, including Camp Randall Memorial, Tenney, Vilas, and Brittingham. The State House, which stands in a well-kept park, was partly destroyed by fire in 1904, and a new capitol, in the form of a cross, has been built at a cost of $7,000,000. One of the finest structures in Wisconsin is the library and museum building of the State Historical Society, opposite the State University campus; it is an Ionic, colonnaded structure, built of Indiana limestone at a cost of $700,000. The society's reference library of 371,000 volumes and pamphlets is one of the best-known American libraries. Within the building are also housed the libraries of the State University and the Wisconsin Academy of Sciences, Arts, and Letters. There are also the Legislative Reference, Carnegie, and the State Law libraries. Madison is the seat of the University of Wisconsin (see WISCONSIN, UNIVERSITY OF); it contains a United States Weather Bureau Station and a forest-products laboratory. The State Hospital for the Insane and the State fish hatchery are in the suburbs.

The city has widespread commercial interests and in its 121 industrial establishments manufactures agricultural implements, boots and shoes, gasoline and oil engines, hospital furniture, electrical machinery, machine tools, art glass, candy, carriages and wagons, and electrical appliances; there are also a beet-sugar plant and several large printing establishments. The government is administered under revised charters of 1889 and 1901, by a mayor, biennally elected, and a unicameral council which controls elections of subordinate officials. The water works are owned and operated by the municipality. Pop., 1900, 19,164; 1910, 25,531; 1914 (U. S. est.), 29,469; 1920, 38,378.

Soon after the organization of the Territory in 1836 this site was chosen for the location of the State capital; and the first house, erected in March, 1837, was for boarding and lodging the workmen on the projected capitol. In 1839 the necessary Territorial building had been built, and since then Madison (named for President James Madison) has been the regular seat of government. It was chartered as a city in 1856. Consult D. S. Durrie, *A History of Madison* (Madison, 1874), and John Nolen, *Madison: A Model City* (Boston, 1911).

MADISON, JAMES (1749-1812). First Protestant Episcopal Bishop of Virginia. He was born near Port Republic, Va., and graduated at

William and Mary College in 1772. After admission to the bar he turned to the ministry, being consecrated priest during a visit to England in 1775. He had been appointed professor of natural philosophy at William and Mary in 1773; four years later he became president of the college. In 1790 Madison was consecrated Bishop of Virginia by the Archbishop of Canterbury, in the chapel of Lambeth Palace. Thereafter he performed the duties of his episcopal office in addition to those of college president and professor. He published sermons and occasional papers and a *Eulogy on Washington*, (1800) and prepared a map of Virginia.

MADISON, James (1751–1836). An eminent American statesman, fourth President of the United States. He was born at Port Conway, Va., March 16, 1751; entered the College of New Jersey (now Princeton University) in 1769; became a notably zealous and close student of the government of the ancient republics; and after his graduation in 1771 undertook the study of law. While only 23, he served on the Committee of Safety of his county, and two years thereafter, in 1776, was a delegate to the Revolutionary Convention of Virginia. In this body he was a member of the committee appointed to draft a constitution, in connection with which work he rendered notable aid to Jefferson in his agitation for the complete toleration of all religious denominations. Madison was sent to the first Legislature elected under this constitution; in the following year he was one of the executive council, and in 1780 he was sent to the Continental Congress, where for three years he served with marked credit—insisting that Spain should allow the United States the free navigation of the Mississippi, and vigorously contending for an extension of the powers of Congress, and for prohibiting the States to issue more paper money. He again became a member of the Virginia Legislature in 1784, where he was again attentive to the problem of the relations of the States under the Confederation and strongly favored the calling of the Annapolis Convention of 1786, although for political reasons he was not a member himself. At the same time Madison, as a member of the Legislature, now successfully urged the passage of Jefferson's bill granting religious toleration, and also pleaded for sound public finance. In 1787 he was again elected to Congress, then in its decadence, and in the same year served in the Constitutional Convention at Philadelphia. In that body he was the author of what became known as the Virginia plan and throughout rendered such manifold and effective service as to win for himself the title of the Father of the Constitution. He was an untiring advocate of the principle of proportional representation in the Upper as well as the Lower House of the national Legislature. Madison coöperated with Hamilton and Jay in the production of the *Federalist* (q.v.), from 20 to 30 of the 80 papers of that work being attributed to him. Of inestimable value to the Supreme Court in the interpretation of the Constitution were the notes of the debates which he kept, and which were published by the government after his death (3 vols., Washington, 1843).

Upon his return to Virginia Madison was chosen a delegate to the Constitutional Convention called to take action on the new Constitution, and in the critical contest in that body he led the Federalists and gained a substantial victory over Henry, Mason, Lee, and the other opponents of the Constitution. The Anti-Federalists, however, were so strong in the Legislature that Madison failed in his candidacy for the Senate, chiefly through the influence of Patrick Henry, although he was elected to the first House of Representatives, defeating James Monroe, a moderate Anti-Federalist. He served in that body for four terms, until the retirement of Washington from the presidency, and as party lines were gradually drawn he became recognized as the ally of Jefferson, and as the leader in the House of the Anti-Federalist opposition to the policy of Alexander Hamilton (q.v.). He proposed the resolutions for the creation of the first three executive departments (those of State, Treasury, and War), proposed a series of amendments to the Constitution—selected from those advocated by the several States—out of which were formed the first 10 amendments as finally adopted, and took an important part in the framing of the first tariff act. The direction of business in the House was to a large extent intrusted to him. A further contribution in the formative period of the government was his insistence upon the President's power to remove his cabinet officers without the concurrence of the Senate. Upon matters involving party policy, from the time of his definite break with Hamilton, he followed the normal course of his associates, opposing Great Britain, and particularly the Jay Treaty (q.v.), refusing to approve fully the administration's policy with reference to the manner of paying the domestic debt, and taking a position of vigorous hostility to the establishment of a national bank. His enemies finally attempted, and with some success, to connect him with the questionable political journalism of Freneau and others. With Jefferson he tried to discredit Hamilton and was charged with the authorship of the Giles resolutions attacking the management of the Treasury. He warmly supported the resolution calling upon the President for the instructions given to Jay and led the attack upon the President's reply. Madison's four years of retirement (1797–1801) were broken by brief service in the Virginia Legislature (1799–1800), and by his noteworthy contribution to political literature, popularly known as the Virginia Resolutions of 1798. (See Virginia and Kentucky Resolutions.) Upon the success of the Jeffersonian Republicans in 1801 Madison was named by Jefferson as Secretary of State and retained the office throughout both terms of his chief. Two years later he was sued before the Supreme Court of the United States by a man named Marbury. The decision reached by the court is one of the most far reaching in the constitutional history of the country. For details, see Marbury vs. Madison. The administrative routine of this service was broken in the early years by the negotiations leading to the purchase of Louisiana and by the strained relations with the Barbary States. The later years, however, produced a series of problems of difficulty and importance, turning largely upon the theories maintained by England as correct principles of international law. It thus fell to the lot of Madison to direct the fruitless mission of William Pinkney to England and to take action at the time of the search of the *Leopard*. The policy of embargoes had been adopted, the war of commercial retaliation had been begun, and the conduct of England and France in regard to American commerce had reached a critical point, when the second term of Jefferson ended and the power of the "Virginia dynasty" was attested by the election to the presidency of Madison, who was Jefferson's candidate, and who received 122 out of 175 electoral votes. His first term was occupied largely by the diplomatic difficulties with England, culminating in a request for the recall of the English minister, and by the protracted dealings with France with reference to the commercial decrees of Napoleon. The anti-English faction gained control of Madison's party, and their activity, coupled with that of the younger pro-war element, finally secured the acquiescence of the President in the congressional policy of war against England. War was declared by the United States on June 18, 1812. As a war president, Madison was at his weakest, and at the outset the Americans suffered serious reverses on land. However, on the sea they won a succession of triumphs. Madison was reëlected to the presidency in 1812, receiving 128 votes, 89 being given to his opponent, De Witt Clinton, who had been set up by a coalition of Federalists and the New York wing of the Republican party. The war with England lasted almost through half of Madison's second term. Madison's presidency witnessed the complete overthrow of the Federalist organization. The old Federalist principles of a strong national government were now largely adopted by the dominant Republican party, as illustrated by the increased appropriations for the army and navy and by the reestablishment of the national bank, in all of which Madison concurred, although he differed from his party upon the warmly contested point of the propriety of making appropriations of national money for public improvements. Upon these matters, as upon the subject of the tariff, neither sectional nor party lines were permanently drawn in Madison's time. Upon his withdrawal from public service Madison retired to Montpelier, Va., where after a period of 20 years of quiet and leisure he died (June 28, 1836). In later life he took much interest in popular education and devoted himself to promoting the interests of the University of Virginia. His last public service was in the Virginia Constitutional Convention of 1829. His wife, formerly Mrs. Dorothea (familiarly known as "Dolly") Payne Todd, who lived until 1849, was for many years a conspicuous figure in Washington society.

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MADISON BARRACKS. A United States military post in New York, established in 1813 and occupying a reservation of 107.72 acres, on Black River Bay, 10 miles from Lake Ontario, adjoining Sackett's Harbor. A rifle range of 868 acres has been established at Stony Point, 16 miles from the post. The usual garrison consists of the headquarters and two battalions of an infantry regiment, with necessary sanitary and supply troops.

MADISON SQUARE GARDEN. One of the largest buildings devoted to amusement in the city of New York. It contains an amphitheatre accommodating 15,000 people and used for horse shows, circuses, bicycle races, and similar purposes, a theatre, a concert and ball room, a restaurant, a roof garden, and a number of studios. The building is notable for its great tower, over 300 feet in height, modeled after the Giralda at Seville. See Plate of SEVILLE.

MAD′ISONVILLE. A city and the county seat of Hopkins Co., Ky., 38 miles south of Henderson, on the Louisville and Nashville and the Kentucky Midland railroads (Map: Kentucky, C 5). It is the centre of a fine agricultural and coal country and has an important tobacco trade and saw and planing mills, flour mills, a tobacco factory, tobacco stemmeries, coal mines, etc. The water works, sewage system, and electric-light plant are owned by the city. Pop., 1900, 3628; 1910, 4966.

MADISONVILLE. Formerly a village in Hamilton Co., Ohio, now part of Cincinnati. It is essentially a residential place. Near here are the Madisonville Prehistoric Cemetery and the Turner group of earthworks, both the property of Harvard University.

MÄDLER, mā′dlẽr, JOHANN HEINRICH (1794–1874). A German astronomer, born in Berlin. He began to study natural science at the University of Berlin in 1822 and in 1830 was appointed an instructor in the Berlin Normal School. As the result of his astronomical observations, he published a map of the moon in 1834–36 and immediately afterward was chosen assistant in the Berlin Observatory. In 1837 he published his *Allgemeine Selenographie*, and in 1840 was made director of the observatory at Dorpat, Russia. There he made extensive researches in regard to the fixed stars and in 1846 published *Die Centralsonne*, propounding the theory that the centre of the stellar universe is located in the Pleiades. In 1865 he returned to Germany. His further publications include: *Fragments sur les corps célestes du système solaire* (1840); *Populäre Astronomie, oder Wunderbau des Himmels* (1841; 8th ed., 1885); *Untersuchungen über die Fixsternsysteme* (2 vols., 1847–48); *Astronomische Briefe* (1844–46); *Der Fixsternhimmel* (1858); *Geschichte der Himmelskunde* (2 vols., 1872–73).

MADNESS. See INSANITY; LUNACY.

MAD′OG (commonly **MADOC**) **AP OWEN GWYNNEDD**, gwĭn′nĕᴅ (c.1150–?1180). A Welsh prince and the reputed discoverer of America. The story is that Madog was compelled by civil strife to leave his native land, that he sailed westward in 1170, and reached a new land whose productions and inhabitants were quite unlike those of Europe. This land is assumed to have been America. He returned to Wales, equipped a second expedition and set sail again, but never returned. The earliest extant mention of Madog is in a poem by Maredudd ap Rhys, who lived in the middle of the fifteenth century. No reference is made to discoveries in the West. In 1584 Dr. David Powel edited and published Humphrey Llwyd's [or Lloyd] translation of *Brut y Tywysogion*, with additions of his own, under the title of *The Historie of Cambria*, and first gave the story of Madog's alleged discovery to the world. Very probably he found the adventure in Llwyd's work. There is no mention of Madog in the original Welsh *Brut y Tywysogion*. The theory of a Welsh discoverer of America was received with considerable enthusiasm in Wales, but during the last century its adherents have gradually disappeared. Some arguments in its behalf, derived from words in the Indian languages supposed to resemble Welsh, and from the reports of a tribe of fair-haired and light-skinned Indians, assumed to be descendants from Madog's colonists, may be found in Catlin, *North American Indians* (ed. 1854). Consult: John Williams: *An Enquiry into the Tradition Concerning the Discovery of America by Prince Madog ab Owen Gwynnedd* (London, 1791); George Burder, *The Welsh Indians; or a Collection of Papers Respecting a People whose Ancestors Emigrated from Wales to America in the Year 1170 with Prince Madoc* (ib., 1797); Thomas Stephens, *Madoc: An Essay on the Discovery of America by Madoc Ap Owen Gwynedd in the Twelfth Century* (ib., 1893). Powel's edition of Lloyd or Llwyd was reprinted in London in 1811.

MADON'NA (It., my lady). A word specially applied to the Virgin Mary which has become common in other languages than the Italian, particularly to describe the Virgin in works of art. Early Christian art only very occasionally portrayed the Virgin. If alone, she stood with arms extended in prayer, as emblematic of the Church or the Saved Soul: this figure of the *Orans* (praying figure) is sometimes inscribed Virgo Maria, but not in the earliest examples. The Virgin enthroned and holding the Child did not become popular until after the Council of Ephesus in 431 had declared her the Mother of God. Byzantine art of the sixth and following centuries created the type of Youthful Virgin that was to be retained in art up to the Renaissance. The apocryphal lives of the Virgin and of the Child Christ, so popular in literature, furnished themes for art, among the earliest being the scenes in the mosaics of Santa Maria Maggiore in Rome (c.432). Characteristically the color of her robe was blue, starred or slashed with gold, and it was represented draped over her head. As Christian iconography (q.v.) developed, the scenes in which the Virgin figured increased, coming at last to include all the recorded events of her earthly life. Later her death (described by Pseudo-Dionysius c.500 A.D.) and her ascent into heaven also became art themes. Finally, in the Last Judgment and scenes from the Apocalypse, she appears, usually as intercessor, at the side of Christ.

There is an uninterrupted series of paintings and sculptures from the time of the mosaics of Sant' Apollinare Nuovo at Ravenna to the Gothic period, showing how systematically Byzantine art created a Life of the Virgin, and how mediæval Western art borrowed these scenes and developed them. It remained for Gothic art to embody the further apotheosis of the Virgin so characteristic of the age of the Troubadours and the Minnesingers, of St. Bernard and of the cathedrals all dedicated to the Virgin. She is there represented, as in the mosaic of Santa Maria in Trastevere (c.1140) or the fresco by Orcagna in the Campo Santo at Pisa, or the sculptured portal of Notre Dame in Paris, as raised into the divine sphere by the side of her Son. Raphael's Sistine Madonna is one of the most beautiful later representations of her as Queen of Heaven. Murillo portrays another favorite theme of the late Renaissance, the Virgin as the woman of Revelations with the moon or the globe under her feet, and especially her Immaculate Conception. At a still later period came the Virgin of the Seven Sorrows, with pierced heart.

It was during the Gothic period that the devotion to the Virgin developed the artistic scene of the Virgin and Child, the scene most often repeated in art between the thirteenth and sixteenth centuries. Cimabue and Duccio painted its most beautiful early examples. Fra Angelico, Filippo Lippi, Ghirlandaio, Giovanni Bellini, Perugino, and a host of other painters followed in the fifteenth century. The scene, which was at first very simple, the Virgin and Child being accompanied merely by angels or adored by the Magi or Shepherds, became complicated. The Magi were accompanied by a caravan of attendants; St. John, St. Catharine, and other figures were introduced, as has been explained under HOLY FAMILY, and saints and fathers of the Church were added in the principal or in accessory scenes.

When applied to a painting or a sculptured group, the term Madonna usually signifies a representation of the Virgin and the Christ Child, either alone or accompanied by saints, who are, however, accessories to the principal subject. It is to be distinguished from such similar themes as the Holy Family (q.v.), the Mater Dolorosa, or the Immaculate Conception. The best-known Madonnas were painted by Italian artists, by whom the theme was chiefly developed.

The emancipation from the stiff Byzantine type of the Madonna was effected in the latter part of the thirteenth century by a number of Italians, chief among whom was Cimabue (q.v.). The best examples of his Madonnas are in San Francesco, Assisi, the Florentine Academy, and the Louvre. While retaining the gold background and the stiff Byzantine type, they show many natural motifs. His younger contemporary, Duccio of Siena, went much further, achieving a more ideal, if freer type, as may be seen in his chief work, the altarpiece of the cathedral of Siena, still preserved there. Fra Angelico (1387–1455) repeatedly treated the subject, the best-known examples being the "Madonna of the Star," in the convent of San Marco (for illustration, see ANGELICO), and the life-size "Madonna Enthroned," surrounded by the well-known angels (Uffizi, Florence)—both severely archaic in treatment. The first artist to break with this conventional treatment was Fra Filippo Lippi, who portrayed the Madonna and Child as the incarnation of maternal love and childish innocence. One of his best-known examples is the beautiful "Virgin Worshiping the Child," lying on a flowery sward in a summer landscape (Berlin Museum); another, in the Uffizi, represents two little angels lifting the Child to the Madonna, who is engaged in devout meditation. The characteristics of Sandro Botticelli's (q.v.) art are nowhere more delightfully revealed than in his Madonnas. Of the two charming circular specimens in the Uffizi, the "Magnificat" is the most representative of his early manner, while its companion piece holds the same rank for his later period. Both represent the Virgin crowned and adored by dreamy angels.

Of Leonardo da Vinci's Madonnas but two probable specimens survive, "La Vierge aux rochers" and the "Madonna with St. Anne," a very unusual though charming representation, in which St. Anne sits in the Virgin's lap. (For description of his other Madonnas, see VINCI, LEONARDO DA.) Michelangelo twice painted the subject—an unfinished Madonna in the British Museum, and the "Madonna of Angelo Doni," in the Uffizi, remarkable for the novel action of Joseph passing the Child to the Madonna over her shoulder, and for the manner in which the background is filled with nude youths. The best-known examples of Andrea del Sarto's Madonnas are the "Madonna del sacco," a fresco over the portal of the cloister of the Annunciata (Florence), so called for the sack upon which Joseph leans, and the "Madonna dell' arpie," which derives its name from the harpies on the pedestal, upon which the Virgin leans. See SARTO, ANDREA DEL.

In the Madonnas of the Umbrian school its dreamy sentiment and ecstatic piety are most strikingly revealed. There are good examples by Perugino in the Uffizi, in the Vienna Gallery and elsewhere; but the best known is the "Enthroned Madonna and Child," surrounded by the patron saints of Perugia, now in the Vatican. Of the Ferrarese work of the fourteenth century it is sufficient to mention the fine altarpiece by Francesco Cossa in the gallery of Bologna, and those of Lorenzo Costa in the church of San Giovanni in Monte (Bologna) and in the Berlin Museum. The altarpiece of Sant' Andrea by Dosso Dossi (sixteenth century), now in the Gallery of Ferrara, representing the "Madonna Enthroned," surrounded by saints, with John the Baptist at the foot of the throne, is one of the best works, both in color and treatment, of Italian art. At Bologna Francia produced a number of Madonnas, celebrated for their mild, reproachful expression, of which the best known are in the gallery there: a "Madonna Enthroned," and the "Virgin in a Rose-Garden," adoring the Child. The best-known Madonnas of Mantegna are the grand altarpiece of San Zeno, Verona, the example in the National Gallery (London), and, most of all, the "Madonna della vittoria" in the Louvre. (For description, see MANTEGNA.) Among the Madonnas of Correggio one in the Uffizi, "La zingarella" (the Madonna as a gypsy), in the Naples Gallery, and the fine example in the National Gallery, represent domestic scenes; more ambitious attempts are the "Madonna with St. Francis" (Dresden) and the famous "Giorno" (day) in the Parma Gallery. See CORREGGIO.

The Madonnas of the Venetian painters of the fifteenth century unite Paduan virility of execution with Venetian charm of color. Especially beautiful are those of Giovanni Bellini, numerous in the Venetian Academy, the Berlin Gallery, and the Brera (Milan). The most imposing examples are a series of great altarpieces, formerly in the churches of Venice, now partly in the Academy, the grandest of which are the "Frari Madonna" (for description, see BELLINI), the altarpiece of San Giobbe (Venetian Academy), and the splendid altarpiece of San Zaccaria. Only one of Giorgione's Madonnas survives, the "Castelfranco Madonna," in the cathedral of that town. The head of the Virgin, who is seated upon a high throne, is of the purest and most pathetic beauty. On her right is San Liberale in full armor, an ideal of knighthood, and to the left is St. Francis. Above a wall in the background may be seen a fair and sunny landscape. Among Titian's (q.v.) Madonnas there are well-known examples at Vienna (including the "Madonna with the Cherries"), at Dresden, in the Louvre, the Uffizi, and the Prado (Madrid). The most celebrated and grandest, however, is the Pesaro Madonna, in the church of the Frari, Venice.

The chief of all Madonna painters, the one who developed the subject to its fullest extent, was Raphael. In his early period he painted a dreamy and sentimental type, the highest development of the Umbrian ideal; in the middle or Florentine period he used the theme to portray the relation of mother and child, while in the Roman he combined with this motif the nobler concept of the Queen of Heaven. Of the large number ascribed to him, over 50 merit consideration; but many of these, especially during the Roman period, were executed by his pupils. Of his earliest period there are two good examples at Berlin, after drawings by Pinturicchio, but the "Connestabile Madonna" (St. Petersburg) is assuredly the finest. The Virgin sits reading in a garden, the Child in her arms; the picture is almost miniature in size and delicate in finish. A more ambitious example, "the Colonna Raphael," in which she is represented surrounded by four saints, is now in the Morgan collection (Metropolitan Museum, New York).

An early work of the Florentine period—perhaps the best and certainly the most popular example—is the "Madonna del Gran Duca" (Pitti Palace, Florence), so called because it was the favorite of the Grand Duke. The Virgin stands erect holding the Child and is statuesque in character and well modeled. Similar in pose is the "Madonna Tempi" (Munich), while those known as the "Colonna" (at Berlin), "Orléans" (Duc d'Aumale), and "Panshanger" (at Panshanger) Madonnas represent the Virgin as seated. All of these have been much damaged by restoration. Another favorite type represents the Virgin as seated in a meadow landscape with the infant Christ and St. John, of which the best examples are the "Madonna in the Meadow" (Vienna); the "Madonna der cardellino" (Uffizi), so called because John presents a goldfinch to the Virgin; and, most perfect of all, "La belle jardinière," in the Louvre. (See RAPHAEL.) Of his more ambitious altarpieces the chief are the "Blenheim" or "Ansidei Madonna" (1505, National Gallery, London), one of the best preserved of Raphael's works, in which the enthroned Virgin is represented between St. John and St. Nicholas of Bart; and especially the "Madonna del baldachino." See RAPHAEL.

The best-known Madonnas of Raphael's Roman period are the "Aldobrandini (Garvagh) Madonna" (National Gallery); the "Madonna col divin amore" (Naples); the "Madonna with the Diadem" (Louvre), probably executed after Raphael's design by Giulio Romano. Of the circular type the best known are the "Madonna della candelabra" (National Gallery), executed by a pupil; the beautiful "Madonna Alba" (St. Petersburg); and, chief of all, the "Madonna della sedia" (of the chair), vying with the Sistine in popularity. He found time also to paint three large altarpieces, the "Madonna di Foligno" (Vatican), in which the Virgin is enthroned in the clouds, with saints and the donor below, while the background is filled with the representation of Foligno struck by a thunderbolt. Another famous example is the "Madonna del pesce" (Madrid), so called from the fish which Tobias, escorted by the Angel, presents to the Madonna; this was executed in part by Giulio Romano. But grandest of all, the culmination of Raphael's Madonnas, and the most perfect representation of the Queen of Heaven in art, is the Sistine Madonna. See RAPHAEL for illustration and description.

Many of Raphael's Madonnas during this period were only designed by him and executed by his pupils, especially by Giulio Romano; as, e.g., the "Madonna del impannata" (windowpane), in the Pitti Palace, the "Madonna del passeggio," in Bridgewater House (London), and the "Madonna della gatta" (cat), in the Museum of Naples. Besides the works executed after the designs of Raphael, Giulio Romano designed Madonnas of his own, the best known of which, the "Madonna della catina" (Dresden), is so called because of the basin in which the Christ Child is being bathed. In general, the Madonnas of the Mannerist and Eclectic schools are of little interest, on account of the lack of real depth of feeling.

In northern Europe fewer examples of "Madonnas" survive, owing in part to the Iconoclastic storms which devastated the churches. Though realistic in type, those of the Early Flemish and German schools do not endeavor to represent the subject as a mere family scene, but retain much of the mediæval dignity. Among the best examples by Jan van Eyck are the "Madonna of Canon van der Poel" (Bruges); the "Virgin in a Gothic Chapel," reputed part of a traveling altar of Charles V, at Dresden; the "Lucca Madonna," suckling her Child (Frankfort), and the famous Madonna of Chancellor Rollin (Louvre). All the other great Flemish masters, Rogier van der Weyden, the Master of Flémalle, Hugo van der Goes, Hans Memling, Gerard David, and Quinten Matsys, delighted in rendering the same theme.

Stephan Lochner's Madonna in the great altarpiece of Cologne Cathedral and other representations of the same subject are gems among the works of the early German school, soft and idyllic in character, while the same subject by Schongauer, in the church of St. Martin, Colmar, is more solemn and grandiose. Dürer's "Madonna with the Pear" (Imperial Gallery, Vienna) is his chief representation of the subject. First in rank among all German Madonnas, as the Sistine among Italian, is the "Madonna of Burgomaster Meyer" at Darmstadt. (For description and illustration, see HOLBEIN.) The great Dutchmen of the seventeenth century were little concerned with Madonnas, the Flemings somewhat more so. The best example by Rubens is the beautiful "Madonna of the Innocents" (Louvre), in which she is portrayed as surrounded by crowds of innocent children; while in Van Dyke's "Madonna of the Rosary" (Oratorio del Santissimo Rosario, Palermo), cherubim and saints surround the Virgin, holding the rosary to St. Dominic.

Among Spanish painters Murillo's Madonnas are of rare coloristic charm and deep religious feeling. Some of the finest examples, representing only the Virgin and Child, are in the Pitti (Florence) and Corsini (Rome) palaces, while in the grand example of the Louvre St. Elizabeth and St. John are also represented. Murillo is especially known for his supernatural aspects of the Madonna, as her Assumption and Immaculate Conception. Madonnas in contemporary art are of less interest, because they are no longer the highest expression of the religious spirit of the day. Prominent among German examples are those by Overbeck (New Pinakothek, Munich), a reflection of the old Umbrian type; of Bodenhausen, Defregger, and Max (Leipzig Museum). The best among the French are Bouguereau's "Madonna of the Angels" and "La Vierge consolatrice" (Paris, Luxembourg), and Dagnan-Bouveret's "Virgin in the Carpenter Shop."

Hardly less than in painting, the subject was a favorite one with the sculptors of Christian art and with the ivory carvers of the Romanesque and Gothic epochs. It was rendered times almost innumerable by the stone sculptors of the Middle Age, appearing on the exterior or in the interior of every cathedral rejoicing in sculpture: at Naumburg (Saxony), Notre Dame de Paris, Chartres, Rheims, etc. That the sculptors of these sublime works are unknown, makes them none the less valuable from the æsthetic point of view. During the Middle Age in Italy it was a favorite theme with the Pisan school, the most powerful versions being by Giovanni Pisano in the cathedral of Prato and the baptistery of Pisa. During the Renaissance its popularity continued, as may be seen in the reliefs of Donatello, and in the exquisite terracotta reliefs of Luca della Robbia (q.v. for illustration) and his followers; of these reliefs there are numerous examples in the Museo Nationale and elsewhere in Florence. The most celebrated examples of a sculptured Madonna are Michelangelo's "Madonna of Bruges," in the cathedral of that city—a beautiful example of his early or realistic period—and the incomparable "Pietà" of St. Peter's. See MICHELANGELO.

Bibliography. Popular books on the Madonna in art are by Mrs. Jameson, *Legends of the Madonna* (London, 1857), and E. Hurll, *The Madonna in Art* (Boston, 1898). A scholarly work, especially important for the earlier periods, is Rohault de Fleury, *La Sainte Vierge* (Paris, 1878); also Baumbach, *Die Madonnendarstellung in der Malerei* (2d ed., Dresden, 1906). The best work on the subject, both as to critical value and illustrations, is Adolfo Venturi, *La Madonna* (Florence, 1900), which, however, is confined to Italian Madonnas; also Ferrigni, *Madonne fiorentine* (Milan, 1912). For the early Netherlands school: Siebert, *Die Madonnendarstellung in der altniederländischen Kunst* (Strassburg, 1906). For the German school: Fäh, *Das Madonnenideal in den ältern deutschen Schulen* (Leipzig, 1884); also F. A. Gruyer, *Les Vierges de Raphael et l'iconographie de la Vierge* (Paris, 1869); Karoly, *The Madonnas of Raphael* (London, 1894). See Plates of ANGELICO; CORREGGIO; ENGRAVING; HOLBEIN; RAPHAEL; ROBBIA; SARTO.

MADOQUA, mä′dô-kwȧ. The native name for a species of antelope in Abyssinia. See BENI-ISRAEL; DUIKER.

MA'DOR, SIR. A Scottish knight who accused Queen Guinevere of poisoning his brother. Her part was espoused by Lancelot of the Lake, who slew Mador in a combat and received as a reward the castle thereafter known as the Joyeuse Garde.

MADOU, mȧ'do͞o', JEAN BAPTISTE (1796–1877). A Belgian genre painter and lithographer. He was born in Brussels and studied under P. S. François. He first excited attention with his drawings and lithographs of the ancient and modern costumes of the Low Countries, scenes in the lives of the Flemish and Dutch painters, and in particular his *Physionomie de la société en Europe depuis 1400 jusqu'à nos jours* (1836). In 1842 he began to paint scenes of popular life in the costumes of the seventeenth and eighteenth centuries, displaying facile invention and a rather superficial humor. His very numerous paintings are executed with much detail in a smooth and uninteresting technique. He is represented in the Brussels Museum by the "Rat Hunt" and other paintings, in the Antwerp Museum, and in the private collections of Europe and America. He also painted decorations in the royal castle of Ciergnon and was a member of the Antwerp Academy.

MADOX BROWN, FORD. See BROWN, FORD MADOX.

MADOZ, mä'dōth, PASCUAL (1806–70). A Spanish statesman, jurisconsult, and author, born at Pamplona and educated in law at Saragossa, where he won his degree of licentiate in a brilliant examination. Despite this and his having served as one of the defenders of Monzón against the French in 1823, and having been a prisoner for several months in the hands of the French, his university soon expelled him, charging that he held Jansenist ideas. Owing to a decree of Calomarde forbidding any one to practice law who was not 25 years old, he went to France and remained at Tours until the amnesty proclaimed by María Cristina permitted his return. He began the practice of law at Barcelona and edited the *Diccionario geográfico universal* (1829–34) and a *Colección de causas célebres* (1840). He became prominent in politics, was appointed a judge, and was elected a member of the Cortes. There he opposed Espartero and ultimately became the leader of the Progressist party. In 1854 he was Governor of Barcelona, in 1855 was Minister of Finance, and in 1856, because of his liberal views, was obliged to leave Spain. Returning, he was active in the revolution of 1868, was Governor of the Province of Madrid, and was a member of the Cortes. He died while accompanying the Spanish deputation to Rome to offer the crown of Spain to Amadeus. His important *Diccionario geográfico estadístico y histórico de España* was published in 1848–50.

MAD PARLIAMENT OF OXFORD. The name given by the adherents of Henry III to the Parliament which assembled June 11, 1258, at Oxford. In the attempt to obtain for his second son, Edmund, the throne of Manfred (q.v.), King of Naples, Henry III had become heavily indebted to the papacy. The Great Council, however, had refused to grant the necessary money without a redress of grievances, and the King was compelled to give his consent for the appointment of a committee of 24, chosen half from the King's party and half from the barons'. The 24 drew up a series of grievances which were presented to the Mad Parliament, and the Provisions of Oxford (q.v.) were framed. Consult Stubbs, *Constitutional History*, vol. ii (4th ed., Oxford, 1896), and H. W. C. Davis, *England under the Normans and Angevins* (New York and London, 1905). See MONTFORT, SIMON DE.

MADRAS'. A province of British India, formerly the Presidency of Madras (Map: India, C and D 6). It occupies, together with its tributary states, the southern part of the Indian Peninsula, being irregularly bounded on the north by Bengal and the Central Provinces, and on the northwest by Bombay, Mysore, and Hyderabad. The province under direct British administration is divided into 22 districts, with a total area of 142,330 square miles; pop., 1891, 35,630,440; 1901, 38,209,436; 1911, 41,405,404. The native states of Travancore, Cochin, Padukkottai, Banganapalle, and Sandur, politically controlled by Great Britain, cover an area of 10,084 square miles; pop., 1891, 3,700,622; 1901, 4,186,967; 1911, 4,811,841. The surface consists of a high plateau land encircled by mountain ranges, the Eastern Ghats extending in a southwestern direction until they merge in the Nilgiris, which are connected with the Western Ghats (qq.v.). A long and broad plain lies between the Eastern Ghats and the shores of the Bay of Bengal, generally known as the Coromandel coast (q.v.), and a narrow plain interspersed with lagoons extends between the Western Ghats and the Malabar coast (q.v.) on the Arabian Sea. The principal rivers, the Godavari, Kistna, and Kavery, all rise in the Western Ghats, and traversing the plateau break through the Eastern Ghats and flow into the Bay of Bengal. The soil of the plateau generally is fertile, and the irrigation systems of the Godavari and Kistna have yielded good returns to the government; the coast lands are sandy and, except in the deltaic regions, sterile. The climate varies according to elevation; on the whole, it is sultry but fairly healthful. While on the west coast the rainfall is usually excessive, in the interior it is generally inadequate, being in the rain shadow of the Western Ghats, and its failure has been the cause of occasional famines; extensive irrigation works have been constructed in the attempt to modify this evil. Forests of teak, sandalwood, eucalyptus, ebony, and rosewood, under reservation rules, cover about 18 per cent of the surface. The chief wild animals are the elephant, gayal (a species of cattle), black leopard, and ibex. The principal minerals are iron, copper, lead, antimony, and silver, while gold, garnets, and diamonds are found in paying quantities, and salt is largely manufactured on the coasts by evaporation. Although there have been many reports of coal discoveries, there are no important workable seams.

Agriculture. The population of the presidency is largely agricultural. But returns from the soil are in general much less satisfactory than in various other parts of India. Agricultural conditions west of the Western Ghats, in the districts of Malabar and South Kanara, are notably different and better than in the greater part of the presidency east of those mountains. In the Malabar Coast (q.v.) the southwest monsoon, with its rain, is unfailing, and agriculture flourishes. East of the Western Ghats, except in favored tracts, as in the great deltas, the rainfall and water supply are uncertain, variable, and often scanty, the atmospheric humidity is generally slight, and over vast areas the soils are shallow, gravelly, or sandy. In these conditions successful agriculture demands the unceasing and intelligent application of scientific methods. "Yet," says a well-informed writer on the subject, "in practice tillage is defective; stock are productively inadequate and largely ill cared for; cattle-power implements, though ingenious, are primitive, and in the Tamil districts almost absent; manures are low in quality and gravely insufficient in quantity; capital is scanty and credit too frequently mortgaged; the ryot is too isolated a unit; and, though hereditary skill is considerable, there is lacking that basis of wider knowledge which alone renders possible an intelligent adaptation or development of practice to meet new conditions, which have swiftly supervened upon a rapid increase of population over unimproved soils and the opening up of trade." The only effective remedy is irrigation, and this is necessarily partial and inadequate, although the government has dammed many rivers, constructed large canals, and built thousands of tanks or reservoirs, and both public and private enterprise has made literally hundreds of thousands of permanent wells. The net area cropped in British territory has been reported as follows: average during the years 1884–85 to 1889–90, 22,201,000 acres; 1890–91 to 1899–1900, 23,872,000 acres; in 1903–04, 25,857,300 acres; in 1911–12, 33,068,400. In addition to the last figure there were reported for 1911–12, 8,935,100 acres of current fallows, 9,371,400 of cultivable waste other than fallow, 24,899,500 not available for cultivation, and 12,798,200 forest. Of the net area cropped in 1911–12, 4,311,700 acres were cropped more than once, so that the total area cropped is reported at 37,380,100 acres. Of this area, to food grains and pulses were planted 28,586,300 acres (including rice 10,289,500, great millet 5,166,300, spiked millet 3,383,600, millet 2,448,400); oil seeds, 2,927,400; cotton, 2,675,800; condiments, 720,700; tobacco, 192,200; indigo, 90,300; coffee, 51,100; tea, 21,100. In 1911–12 irrigation was practiced on 9,586,900 acres (net), planted chiefly to rice. Of the total irrigated area, 3,534,800 acres were irrigated by government canals, 179,600 by private canals, 3,298,700 by tanks, 1,442,300 by wells, and 1,131,500 by other sources.

Other Industries, Commerce, etc. The native cotton-manufacturing industry, which was widely developed in former years, has greatly diminished under foreign competition. For 1911–12, 20 cotton mills were reported, and the output of yarn 42,838,000 pounds, as compared with 203 mills and 590,842,000 pounds for all British India. The manufacture of cigars has acquired some importance. In a few places ivory carving has become important, and the old occupation of metal working still has a considerable following. Salt is extensively produced along the east coast, but under a government monopoly. Some indigo is manufactured. The trade of the province suffers from the want of adequate harbor facilities on the east coast. Much of the trade is by rail to Bombay and other large trading centres. In the foreign trade imports and exports of private merchandise increased from £4,802,403 and £8,736,782, respectively, in 1902–03 to £6,836,583 and £12,513,891 in 1907–08 and £7,794,808 and £15,400,446 in 1911–12 (total for British India, in 1911–12, £92,383,255 and £151,896,113). The leading imports include cotton piece goods and yarn, metals, hardware and machinery, railway material, and apparel; principal exports: cotton and cotton piece goods, hides and skins, grain and pulse, coffee, seeds, spices, and tea.

Population. The population in British territory has been returned as follows: in 1871, 31,220,973; in 1881, 30,87,218 (the decline of about 1.5 per cent was due to the famine of 1876–78); in 1891, 35,630,440 (increase, about 15.7 per cent); in 1901, 38,229,654 (7.3); in 1911, 41,405,404 (8.3). The Madras native states are Travancore, Cochin, Puddokotai, Banganapalle, and Sandur. The number of inhabitants in British territory, in the native states, and the total, with decennial increase per cent, are shown below for 1901 and 1911:

	1901		1911	
	Number	Increase	Number	Increase
British territory	38,229,654	7.3	41,405,404	8.3
Native states	4,188,086	13.2	4,811,841	14.9
Total	42,417,740	7.8	46,217,245	9.0

In 1911 there were in British territory 20,382,955 males and 21,022,449 females; of the males and females respectively, the unmarried numbered 10,862,162 and 7,832,583; married, 8,734,806 and 9,286,460; widowed, 785,987 and 3,903,406. There is an extraordinary diversity of languages in Madras, although the great mass of the people speak either Tamil or Telugu. In 1901 Tamil was the vernacular of about 15,183,000; Telugu, 14,277,000; Malayalam, 2,861,297; Kanarese, 1,519,000 (these four belong to the Dravidian subfamily of the Dravido-Munda languages); Oriya, 1,809,000; Hindustani, 880,000; others, 1,687,000. The Dravidians are dolichocephalic and of medium stature, with dark (almost black) skin, curly (but not woolly) hair, and high nasal index. The following table shows the population by religion in 1911:

	British territory	Native states	Total
Hindus	36,806,978	3,321,757	40,128,735
Sikhs	7	....	7
Jains	26,995	150	27,145
Buddhists	693	16	709
Parsis	488	10	498
Mohammedans	2,740,408	314,498	3,054,906
Christians	1,191,259	1,154,209	2,345,468
Jews	71	1,248	1,319
Animists	638,463	19,953	658,416
Others	42	......	42
Total	41,405,404	4,811,841	46,217,245

Christians in British territory increased from 1,024,071 in 1901 to 1,191,259 in 1911; in the native states, from 910,409 to 1,154,209; and in British territory and native states combined, from 1,934,480 to 2,345,468. A very large proportion of Indian Christians are in Madras. The number in British India increased from 1,904,401 in 1901 to 2,492,277 in 1911; and in British India, together with all the native states, from 2,923,241 to 3,876,196. By sect, most of the Hindus are followers of Vishnu or Siva, the former predominating in the Telugu country and the latter in the extreme south; in the western Deccan many of them are Lingayats.

The people live mostly in villages of only a few hundred inhabitants each. The only large cities or towns are Madras, the third largest city in India, with 518,660 inhabitants in 1911 (increase over 1901, 1.8 per cent); Madura, 134,130 (22.2); Trichinopoly, 123,512 (16.5); Calicut, 78,417 (1.9); Salem, 59,153 (decrease, 17.8).

Education. In 1911 the educational condition of the people was as follows:

		British territory	Native states	Total
Illiterate. . .	Males. .	17,572,747	1,836,475	19,409,222
	Females	20,739,097	2,286,544	23,025,641
Literate. . . .	Males. .	2,810,208	575,283	3,385,491
	Females	283,352	113,539	396,891
Literate in English. . .	Males. .	247,392	33,942	281,334
	Females	27,233	4,764	31,997
Total population. . . .	Males. .	20,382,955	2,411,758	22,794,713
	Females	21,022,449	2,400,083	23,422,532

Notwithstanding the fact that the great majority of the people are illiterate, steady progress is noted in public education. In 1911–12 there were in public colleges 5752 male students and 49 female; in public schools, 937,617 male pupils and 209,468 female; in private institutions, advanced and elementary, 110,011 male students and 17,168 female; total, 1,053,380 male and 226,685 female, as compared with 884,848 male and 172,322 female in 1907–08. The total number of educational institutions in 1911–12 was 31,052, with 1,280,065 scholars; of these, 1,233,161 were studying a vernacular language, 89,660 a classical language, and 156,110 English. Among the leading educational institutions are the Madras University, Madras Christian College, Presidency College, Pachayyappa's College, a law college, an engineering college, a medical college, and a school of arts—all at Madras; the government arts colleges, at Rajahmundry and Combaconum; a teachers' college at Saidapet; and a college of agriculture at Coimbatore.

Government. The Governor is appointed by the crown. Also appointed by the crown is his executive council, which consists of two members of the Indian Civil Service and an Indian member; the Secretary of State for India may increase the number to four. There is a legislative council of 48 members, official or elective. Each of the 26 districts into which the province is divided is administered by a collector and inferior officers. Unlike other provinces, the districts are not grouped into commissionerships. There are district and subdistrict boards and village committees. In the fiscal year 1911–12 the revenue of Madras amounted to 14,83,11,494 rupees and the expenditure to 7,98,73,223 rupees. The most important source of receipts is the land revenue, which amounted to 5,65,32,986 rupees. In addition to the provincial revenue and expenditure are those of the municipalities and district boards. The ordinary receipts and disbursements of the municipalities in 1911–12 were 84,81,000 and 83,83,000 rupees respectively; of the district boards, 1,49,73,000 and 1,30,58,000 rupees.

History. Anciently the province was divided into several kingdoms, of which the chief were Telingana on the northeast, Karnataka on the west, and the Tamil principalities of Pandya, Chola, and Chera in the south. Splendid architectural monuments, stone and brass inscriptions, and imaginative traditions attest their former existence. Authentic history begins with the Mohammedan invasion of the fourteenth century, when Ala ud din conquered the kingdoms of Karnataka and Telinga. After the Mohammedan evacuation the native dynasty of Vijaynagar dominated until 1565, when it was overthrown by the Deccan Mohammedans; later the country again became divided into principalities, of which the more prominent were the Carnatic, Mysore, and Tanjore. After the first visit of Vasco da Gama, in 1498, Madras was one of the principal battle grounds of the Portuguese, Dutch, French, and British in the struggle for supremacy. The English under Clive and Coote drove out the other Europeans, but it was not until the close of the nineteenth century that native uprisings were completely checked.

MADRAS'. A seaport city, capital of the Madras Presidency, British India, situated on the Coromandel coast of the Bay of Bengal, 835 miles southwest of Calcutta and 640 miles southeast of Bombay; lat. 13° 4′ N., long. 80° 15′ E. (Map: India, D 7). It is the third city in size in India and has railroad and telegraphic communications by the main systems with the principal towns of the Empire, but although much has been done to improve its harbor facilities, it is no longer a port of call for the principal European lines of ocean steamers, owing to the insecurity of its harbor. The city, including the nine suburbs, covers an area of 27 square miles, extending along the coast for 9 miles and inland for nearly 4. Centrally situated on the shore is Fort St. George, strongly fortified and garrisoned by European and native troops and containing the council house, civil and military offices, and St. Mary's, the oldest English church in India, dating from 1678. Adjoining the fort on the north is the commercial district of Black Town (officially George Town, after the visit of the Prince of Wales in 1906), a low-lying, poorly built, and densely populated quarter, covering an area of a square mile, protected from inundation by a strong sea wall. Here are situated the mercantile establishments, the Bank of Madras, the post office, and the old High Court, now occupied by the customs offices, its tower with a modern installation serving as the lighthouse for the harbor, which extends along the larger portion of the water front of Black Town. To the south and rear of the fort is the Island, formed by the encircling Cooum River, containing barracks and forming an extensive military parade and recreation ground. It connects by bridges on the north with the People's Park, which consists of ornamental grounds with a considerable zoölogical collection, and on the west and south with the residential sections, where are situated the handsome Government House, the clubs, marine parade, the Chepauk Park and buildings, St. Andrew's (the Scottish kirk), the fine university buildings, and the native hospital. On the Mount Road, commanding a magnificent view of the city and its vicinity, is St. George's Cathedral, in Ionic style, containing several beautiful monuments by Chantry and Flaxman. Other noteworthy features are the new Law Court buildings in a Hindu-Saracenic style of architecture, opened in 1892, the new Law College, the Christian College buildings, Pachayyappa's College and hall, the memorial hall, the grand arsenal, with an interesting military museum, the observatory, founded in 1792, which gives standard time to all India, and several native mosques and temples. The southernmost extension of Madras is the old Portuguese town of St. Thomé, near the Adyar River, with the ancient Roman Catholic cathedral of St. Thomé. There are several charitable and benevolent institutions, and Madras is noted for its educational establishments, which include the university, founded in 1857, colleges of agriculture, of engineering, medicine, and law, a teachers' college, six missionary colleges, Victoria Technical Institute, a government school of arts, a valuable museum, libraries, zoölogical and botanical gardens, and literary and scientific institutions.

The city's affairs are administered, under a charter of 1884, by 32 commissioners, eight, including a salaried president, being appointed by the provincial authorities and 24 being elected by the ratepayers and certain public bodies. Madras has undergone much modern improvement; it has a good reservoir water supply, conveyed from a distance of 7 miles, and a sewage-farm disposal system, and is lighted by gas and electricity. Harbor works, commenced in 1876 and partially destroyed by a cyclone in 1881, were completed after much difficulty in 1896; they consist of two breakwaters, respectively 3907 and 3726 feet long, inclosing a large water area fronting Black Town. Passengers are now enabled to land in comfort without the former perils attendant on a passage through the notorious Madras surf, but during the cyclones of the monsoon periods the harbor is unsafe for large ships, which seek the open sea on receipt of meteorological warning. Numerous wrecks, many of historic interest, have occurred in the Madras roadstead. The foreign trade is on the increase. In 1898–99 the imports and exports of private merchandise amounted to £2,837,787 and £2,911,281, respectively; in 1903–04 they amounted to £4,076,895 and £3,411,948 respectively; in 1911–12, £6,241,353 and £4,656,843. The chief exports are cotton, rice, coffee, hides, and skins. Local traffic is facilitated by the Buckingham, Cochrane, and Cotton canals. Madras has some large cotton mills, but its industries are purely domestic and of no great magnitude. The United States is represented by a consul. The mean annual temperature is 82°; during the hot months the thermometer frequently registers 96° in the shade, but the heat is pleasantly tempered by "the doctor," a sea breeze so named by the residents, which sets in at noon and lasts till night. The seasons are distinctly marked by the monsoons, the northeast lasting from October to February and the southwest from May to October.

The population of Madras in 1871 was 367,552; in 1881, 405,848; in 1891, 452,518; in 1901, 509,346; in 1911, 518,660. Of the total population in 1901 about 79 per cent were Hindus, over 11 per cent Mohammedans, and about 8 per cent Christians. The chief vernacular is Tamil; Telugu is next in importance, being spoken by about one fifth of the people.

The Portuguese founded St. Thomé in 1504, but Madras dates from a grant of land made by the Raja of Chandragiri to a British subject in 1639 and the construction of Fort St. George. The place, known as Fort St. George, was raised to the rank of a presidency in 1653. By 1743 Madras had developed into the largest city of southern India; in 1746 it was captured by the French, but was restored in 1749 under the Treaty of Aix-la-Chapelle. In 1749 St. Thomé was annexed by the English. Madras was again besieged, but unsuccessfully, by the French in 1758–59.

MADRA′SAH (Ar., school, from *darasa*, to study). The name given by Mohammedans to their colleges or institutions of higher education. In the first centuries of the Hejira there were no separate buildings for educational purposes; elementary and advanced instruction were both given in the mosques themselves or in annexes, and were largely of a desultory and voluntary character. In the eleventh century Nizan el Molk, under the Sultan Alp Arslan, is said to have founded the first college or *madrasah*, and the custom spread rapidly to every part of the Mohammedan world. Each of the four orthodox sects established colleges in the principal cities for the teaching of its tenets. Those of Bagdad at once became famous, and soon after those of Cairo (under Saladin), of Damascus (where over 30 existed), of Cordova, Seville, Malaga, and Granada in Spain, and of many cities in north Africa (Fez, Kufa, etc.), Turkestan, and Persia (Ispahan, Shiraz). Later there are said to have been as many as 500 colleges in Constantinople.

Sometimes these colleges were of a general character, teaching the doctrines of all four orthodox sects, as regards theology and jurisprudence, with the related or propædeutic subjects of grammar, exegesis of the Koran, traditions, rhetoric, logic, ethics, as well as such subjects as pure literature, medicine, mathematics, physics, and philosophy. There was a regular staff attached to each, divided ordinarily into three classes: the *cadi* or judge, the *mudarris* or professor, and the *katib* or reader. They received a salary from the endowment of the college, which was administered by a body of trustees; such property was called *wakf*. A certain number of regular students were also supported from this endowment, both teachers and students living in the college buildings. Besides a large lecture hall and several smaller ones, a hospital and operating rooms, a library, dormitories, kitchen and refectory, there were large and small special buildings, particularly mausoleums and a mosque for religious devotions. Sometimes there were observatories and botanical gardens.

Hardly any large Mohammedan city is without several such madrasah groups of buildings, usually of the late mediæval period. For the study of architecture they are almost as important as the mosques (q.v.). In fact, they usually include both mosques and minarets, and sometimes the mosque forms the centre and key of the group of buildings. The magnificent so-called mosque of Sultan Hasan at Cairo (fourteenth century) is really a college with a mosque attached to it; so is that of Kalaûn. Others at Cairo are those of Khawand el Baraka, of Kaït Bey, of sultans Barkuk and Muayyed. That of El Azhar belongs to the greatest of all Moslem universities. If in these and many other cases the buildings of the college proper are subordinate to the mosque, there are others where it is not so. The madrasah of Sultan Hussein at Ispahan, built around an immense court, with a double gallery of arcades, is especially magnificent. The word as applied to Turkish institutions takes the Turkish form of *medress* or *medressé*.

MADRAS SYSTEM. See MONITORIAL SYSTEM.

MADRAZO, mä-drä′thō. A family of Spanish painters. The eldest, Don José de Madrazo (1781–1859), was born in Santander and studied under Ferro at the Madrid Academy, under David in Paris, and later at Rome. He was director of the Academy of San Fernando and exercised a decidedly deteriorating influence on the development of Spanish painting. His pictures, mostly historical, and painted in a dry, classical style, include several in the Madrid Gallery and one in the Quirinal Palace, Rome.

His son and pupil, Don Federigo (1815–94), born in Rome, studied also under Winterhalter in Paris, then returned to Spain, and in 1859 became professor in the Academy of Madrid. With his brother-in-law, Ochoa, he founded *El Artista* (1835). Madrazo's most typical canvases are the able and numerous portraits of Spanish nobles, especially of Queen Isabella, of Angel Saavedra, and of Campoamor. In his historical paintings, which are of less merit, he imitated Murillo's coloring and produced such pictures as "Godfrey de Bouillon Crowned King of Jerusalem" (Museum of Versailles) and "Maria Christina at the Bedside of Ferdinand VII." Among his later works were some excellent genre pictures, the chief being "The New Song," "The Cigarette," and "The Musical Matinée." He was court painter and curator of the Madrid Gallery and did much to revivify Spanish art.

Don Raimundo (1841–1920), the most gifted member of the family, was born in Rome, and studied with his father Don Federigo, at the Beaux-Arts, Paris, and under Cogniet. His portraits have exceptional dash, brilliancy, grace, and finish, and show excellent draftsmanship and able characterization. Fine examples are the Queen Regent of Spain; the Countess Pillet-Will; Mrs. Cornelius Vanderbilt, Mrs. Whitney, Miss Anne Morgan, Madame Madrazo, and Samuel P. Avery (Metropolitan Museum, New York). His genre paintings are no less brilliant in execution and color. He received a first-class medal at the Paris Exposition of 1878 for "The End of a Masked Ball" (purchased by W. H. Vanderbilt). Other typical works are: "Fête during Carnival" and "Girls at a Window," both in the Metropolitan Museum, New York; "A Lady with a Parrot" (W. A. Clark, New York); "Woman with a Guitar," "Déjeuner of the Infanta," and "Pierrette." He received many medals and was made a Commander of the Legion of Honor. He established himself in Paris. His brother Ricardo (1852–), born in Madrid, studied under his father and his brother-in-law Fortuny, and became well known as a portrait and genre painter.

MADRE DE DIOS, mä′drâ dâ dyôs (native name *Amaru-Mayu*). The principal tributary of the Beni River (q.v.) in South America. It rises in the Carabaya Range in the southeastern part of Peru, about 50 miles east of Cuzco. Thence it flows eastward for 900 miles through the almost unknown forest regions of La Montaña, crossing the extreme northern part of Bolivia almost parallel with the Brazilian boundary. At Rivera Alta it enters the Beni, about 150 miles from its confluence with the Mamoré. It was long an object of geographical conjectures, only its upper course being known until 1865, when it was explored by a party sent out by the London Geographical Society. It is a magnificent stream, over 500 yards wide at the Bolivian frontier and 1500 yards wide at its confluence with the Beni. It is as yet little used, but since 1881 the exploitation of rubber along its shores has been carried on.

MAD′REGAL. A West Indian name for one or two of the lesser species of amber fish (q.v.), as *Seriola fasciata* and *Seriola falcata.*

MAD′REPORE (from It. *madrepora*, mother-of-pearl, probably from *madre*, from Lat. *mater*, mother + Gk. *πόρος*, *poros*, passage, pore, or *πῶρος*, *pōros*, light friable stone). A large branching coral abounding on the reefs of Florida and other parts of the tropics in the Atlantic, Pacific, and Indian oceans. The most abundant species in the West Indies is *Madrepora cervicornis*, so called from its habit of growing in bushlike masses nearly 2 feet high and 3 to 4 feet in diameter, the separate spikes or branches resembling the antlers of a deer. It is the most abundant of the true reef-building corals. It grows up to the level of the sea, and then, becoming exposed at low water, the tips of the branches are often killed. It easily breaks when exposed to the waves, as it usually is, and its fragments form a large proportion of the coral sand, which becomes solidified into coral rock. See Coral, and accompanying Plates.

The madrepore is the most complex of all the corals. Its treelike form is due to multiplication of the smaller corallites by budding. A corallite is the individual polyp of the colony supported by its coral stock or skeleton. It is a perforate type of corals, all parts of the coral stock and connecting cœnenchym (formed by the calcification of the cœnosarc or inner layer of the polyp) being like a meshwork consisting of calcareous fibres arranged like basketwork, and traversed by a network of tubes, representing the cœnosarc and communicating with the other polyps of the colony. The madrepores do not live in water the winter temperature of which is under 60° F. They abound on the Bermuda Islands in the Atlantic, and as far north as southern Japan in the Pacific Ocean, while their southernmost limits are Rio de Janeiro and St. Helena in the Atlantic and Queensland and Easter Island in the Pacific Ocean. Thus they extend to about north and south latitude 30°.

Consult authorities cited under Coral, and particularly Saville Kent, *The Great Barrier Reef of Australia* (London, 1893), containing many illustrations from photographs of these and other reef corals.

MADRID′, *Sp. pron.* mȧ-drēᴅ′. The capital of Spain and of the Province of Madrid in New Castile. It is situated in lat. 40° 24′ N. and long. 3° 41′ W., nearly in the centre of the Kingdom, on a plateau 2100 feet above the sea, and on the left bank of the Manzanares, a small affluent of the Jarama, which latter flows into the Tagus (Map: Spain, D 2). The situation is unfavorable from almost every point of view. The surrounding plateau is treeless and bare and almost uninhabited, and the city is exposed alike to the scorching south winds and the fierce rays of the sun in summer and to the icy north winds from the snowclad Sierra de Guadarrama in winter; the extreme annual range of temperature sometimes reaches 100°. The clearness and dryness of the atmosphere, however, and the extensive plantations which have in the last half century grown up in the suburbs make the climatic conditions less unbearable.

The old city has the form of an oval contracted at the middle, and was surrounded by a wall which was razed in 1878, thus bringing the suburbs into the greater modern city, which is well provided with plazas, parks, and promenades. In the centre of the old city is the plaza called La Puerta del Sol, from the gate which stood there in mediæval times. This is the business centre and the terminus of all the street railways, and around it are the most prominent hotels and commercial houses. In its centre are a monumental fountain and a statue of Philip II. From here the principal streets of the city radiate in all directions. Westward run the Calle del Arenal and Calle Mayor, both leading into the large open place in which is the Royal Palace, and which in the north, in front of the palace, is laid out in the plantation called Plaza de Oriente. Here is the magnificent equestrian statue of Philip IV; it was designed by Velazquez and cast by Tacca. Farther west, between the palace and the river, are the royal gardens, and from these the Puente de Segovia and the Puente del Rey lead across the river into the large royal park of Casa de Campo. Eastward from the Puerta del Sol run the Calle de Alcalá and the Carrera de San Jerónimo into the broad and magnificent boulevard (Paseo) which runs north and south the entire length of the city and between it and the eastern suburbs. This is one of the finest promenades in the world, is shaded by four to six rows of trees, and ornamented by a number of fountains, statues, and other monuments, among which are an obelisk and an equestrian statue of Queen Isabella. The names of the boulevard, beginning at the south, are the Paseo del Prado, Salón del Prado, Paseo de Recoletos, and Paseo de la Castellana, and it terminates in the north at the Hippodrome. East of the Paseo del Prado is the Botanical Garden, and east of the Salón del Prado the Jardín del Buen Retiro; eastward of both and separated from them by the Calle de Alfonso XII is the large Retiro or Parque de Madrid; these parks are beautifully laid out with lakes and parterres, and ornamented with fountains and statues. Among the public monuments should be mentioned some of the old city gates which have been left standing as triumphal arches. The chief of these is the Puerta de Alcalá in the Plaza de la Independencia, an expansion of the Calle de Alcalá east of the Paseo. It was erected in 1778 in honor of Charles III, and is an imposing structure pierced by five gateways, the three in the middle being arched.

Madrid is distinctly of modern date, and it has none of the old architectural monuments boasted of by other Spanish cities. Foremost among the buildings stands the Royal Palace, on the site formerly occupied by a Moorish castle, which was renovated and used as a residence by Emperor Charles V and the monarchs of the Hapsburg dynasty. The modern palace was planned by Philip V, begun in 1738 and occupied in 1764. It is an imposing granite structure, built on a square plan with sides 470 feet long inclosing an inner court, while two projecting wings to the south inclose the Plaza de Armas. The uneven site is leveled by huge substructures of solid masonry. Above these are three basement stories, the fourth or principal floor being surrounded by a balustrade from which a series of Ionic and Doric columns reach to the roof. At the main entrance is a large *patio* containing statues of Roman emperors. The interior halls and salons are superbly decorated with frescoes, paintings, and statuary. Next to the palace, the finest building in the city is that of the National Library and Museum, situated on the Paseo de Recoletos. It is a new building, finished in 1892, and is regarded as one of the handsomest of its kind in Europe. It is a large rectangular structure with a wide flight of marble steps leading from the Paseo to the main entrance; in the interior is a large reading room 90 feet square and 60 feet high. Among other secular buildings might be mentioned the city hall and the buildings devoted to the departments of the government, especially that of the Ministry of War, which occupies the vast palace formerly the residence of the dukes of Alba, and the large and handsome building at the south of the Botanical Garden, which is occupied by the ministries of Public Works, Agriculture, Industries, and Education, and nearly opposite which is the new station of the Southern Railway. The two houses of the Cortes meet in separate buildings, the Senate occupying an old Augustinian convent which has been restored. The Bank of Spain and the Royal Exchange occupy new and monumental buildings. The most notable of the churches is probably that of San Francisco el Grande, built in the eighteenth century, and recently subjected to an extensive restoration. Its main body is circular, surmounted by a grand cupola, and with two lateral towers.

Foremost among the educational institutions of Madrid is the university with over 5000 students. (See MADRID, UNIVERSITY OF.) There are also a normal school, a veterinary school, schools of commerce, engineering, architecture, music and fine arts, and the astronomical observatory, an elegant and well-equipped building situated in the Parque de Madrid. Between the Parque and the Prado is the Botanical Garden, containing an immense wealth of flora as well as large herbaria and other collections. Madrid is rich in libraries and museums. The National Library, in its large new building, contained, in 1913, 650,000 volumes, about 30,000 manuscripts, a collection of 100,000 engravings and drawings, a fine archæological collection, and a museum of natural history. The library of the university contained, in 1913, 267,000 volumes, and the Marine Library has 26,383 volumes. The National Museum of Painting and Sculpture, occupying a fine large building on the Prado, has a collection of masterpieces rivaling those of the Louvre. Raphael, Titian, Rubens, etc., are well represented, and above all the painters of the Spanish School, Velazquez being here seen at his best. Another famous museum of Madrid is the Royal Armory, containing the richest and finest collection of arms in existence. Besides these are a number of minor museums. Madrid is the seat of various scientific and literary societies, chief among which are the Spanish Academy, similar in scope and purpose to the Académie Française, and the Historical, Anthropological, and Geographical societies.

Madrid has a score of theatres; the most prominent are the Teatro Real, facing the Royal Palace, the Teatro de Apolo, and the Teatro de la Comedia, which is one of the most popular. The Plaza de Toros, or bull ring, is a magnificent structure built in pure Moorish style and seating over 13,000 spectators. There are a number of large and well-equipped hospitals and asylums and a fine new model prison. The public works of the city are in general well developed, especially the electric street railways and gas and electric light; there is also a good system of street cleaning. The water supply, however, formerly noted for its abundance and purity, did not keep pace with the population. The old reservoir of the Lozoya canal (32 miles long) became inadequate, and two new reservoirs were constructed.

Formerly Madrid was conspicuous for its lack of industrial activity. Owing to the unfavorable situation, the cost of living was very high, and it was chiefly the fact of its being the capital, with the numerous train of officials, courtiers, and office seekers, that made it a lively and bustling town. But since the last decade of the nineteenth century its industries have developed remarkably. Among its factories the principal is the large national tobacco factory. There are manufactures of jewelry, leather articles, fans, umbrellas, musical instruments, chemicals, soaps, perfumes, drinks, and many other articles. The commerce of the town is active. It is the general railroad centre for the entire country, as well as the principal storehouse for the inland provinces. There are two large and a number of smaller markets, several prominent banks and commercial and insurance companies, an exchange, and a chamber of commerce. The population of the municipality in 1877 was 395,871; in 1900, 539,835; in 1910 (census of December 31), 599,807; est. pop., 1919, 608,793.

Nothing is known of Madrid previous to the Saracen occupation. In the tenth century it appears as a small fortified outpost under the name of Majerit (Majoritum). It was taken from the Moors by Alfonso VI in 1083, but was recaptured in 1109 and held for a short time by the Almoravides. The Cortes met in Madrid for the first time in 1329, but it was not until 1560 that the city was made the permanent capital of Spain by Philip II. On Jan. 14, 1526, a treaty was concluded at Madrid between Charles V and Francis I, who was then a prisoner in the hands of his rival. Francis, having secured his liberty, violated the terms of the treaty and renewed the struggle with Charles. On May 2, 1808, the citizens of Madrid gave the signal for the War of Independence, by rising in revolt against the French general, Murat. Over 1500 of the patriots were killed in a battle on the Prado, where a monument now commemorates them. For this brave attempt the city received the title of *Muy Heróica Villa*. Curiously enough, though it is the largest town in the Kingdom, it has never received the title of *ciudad*, or city.

Consult: Amador de los Ríos and Rada y Delgado, *Historia de la villa y corte de Madrid* (4 vols., Madrid, 1860–64); Valverde y Alvarez, *La capital de España* (ib., 1883); Williams, *Toledo and Madrid: Their Records and Romances* (London, 1903); A. F. Calvert, *Madrid: An Historical Description and Handbook of the Spanish Capital* (New York, 1909); J. C. Van Dyke, *Madrid: Critical Notes on the Prado* (ib., 1914).

MADRID, UNIVERSITY OF. A Spanish university which originated in the foundation of the College of Doña María of Aragon by Alonzo Orozco in 1590, perhaps on an older foundation of 1508. The Hapsburg kings set up schools for mathematics and science in the Alcázar in the sixteenth and seventeenth centuries, and in 1786 the College of San Carlos was opened in Madrid for the study of medicine and surgery. After many plans to move the University of Alcalá to Madrid, the transfer was finally accomplished in 1836–37, and from this removal the foundation of the University of Madrid may be said to date. It is now one of the largest of European universities, and the leading institution of Spain. United with it is the great preparatory school of San Isidorio, founded by Philip IV, and reconstituted by Charles III in 1770. The University of Madrid has a budget of more than 1,000,000 pesetas, and it had in 1913 an attendance of 5675 students, the great majority of whom are in the faculties of law and medicine. The library has over 267,000 volumes and about 5500 manuscripts. The University of Madrid includes museums, clinics, collections, and an observatory.

MADRID, JOSÉ FERNÁNDEZ-. See FERNÁNDEZ-MADRID, JOSÉ.

MAD'RIGAL (Fr. *madrigal*, from It. *madrigale*, OIt. *madriale*, *mandriale*, ditty, Lat. *mandra*, from Gk. *μάνδρα*, flock; the etymology *matricalem* from *matrem*, mother, has also been suggested). A short lyrical poem, adapted to the quaint and terse expression of some pleasant thought, generally on the subject of love. Though somewhat varied in form, it usually consists of from six to 13 short iambic lines constructed upon three rhymes. Developed in Provence, it became very popular in Italy, where the best writers of madrigals are Petrarch and Tasso; among the French, Clement Marot; among the Germans, Hagedorn, Voss, Goethe, and Schlegel; and among the English, William Drummond, Lodge, Withers, Carew, and Suckling. The name madrigal is also applied to a form of vocal composition which during the sixteenth century occupied a position very similar to that of the *Kunstlied* (art song) of to-day. It was set generally for five voices, but madrigals for three, four, six, and eight voices are also found, usually without accompaniment, and in counterpoint. The texts were generally of an erotic character, as the first musical settings for madrigals were the compositions of troubadours, but the form was later much used by ecclesiastical musicians. The madrigal differed from the more popular frottola and villanella in its elaborate contrapuntal workmanship. Dante's friend Casella is reputed to have been the first notable composer of this form in Italy. But the real father of the madrigal is Adrian Willaert (1480–1562), who was born in Flanders, but went to Italy and there developed this form from the then existing frottola. As perfected by this master the madrigal, usually developed from the theme of a plain song or popular melody, soon found its way beyond Italy. In 1538 Arcadelt published in Venice a book of madrigals, in the form already established by Willaert. It was received with enthusiasm. The Flemish school which then developed was a flourishing one and in turn influenced the Italian madrigal, which helped to develop the opera, for after the establishment of the "monodic style" popular madrigals were arranged for a solo voice with accompaniment of the lute or some other instrument. In this way the madrigal became an important factor in the propagation of the new monody. The precursor of the Florentine *dramma per musica* (see MONODY) was in fact nothing else than a succession of monodic melodies loosely strung together. After the establishment of monody, madrigals gradually fell into disuse, but not before the great Roman school under Palestrina and the Venetian school with its Gabriellis and Costanzo Porta had produced interesting examples of this form. Madrigals were introduced early into England, but the first English collection, *Musica Transalpina*, edited by N. Yonge (1588), was made up mainly from translations of the Italian. Previously, however, in 1530, a collection of polyphonic songs had been published by Wynkyn de Worde. There are now extant more than 1000 madrigals composed by about 100 different musicians of the seventeenth century. Among the most distinguished English composers in this form are William Byrd (the earliest), John Wilbye, John Dowland, Thomas Morley, and Orlando Gibbons. In 1604–10 the famous collection, "The Triumphs of Orcana," was published and in 1741 the Madrigal Society of London was founded. In the latter part of the seventeenth century few madrigals were sung and fewer composed. Part songs were still in favor, but they lacked counterpoint, the peculiar characteristic of the madrigal, which for nearly two centuries had held its place in musical performances. Consult: Karl Vossler, *Das deutsche Madrigal* (Weimar, 1898); Cox, *English Madrigals in the Time of Shakespeare* (London, 1899); S. Tomaselli, *Il madrigale nella seconda meta del secolo XVI* (Belluno, 1904); J. A. Fuller-Maitland, "A Waning Glory of England, the Madrigal," in *Nineteenth Century and After*, vol. lvii (London, 1905); Gaetano Cesari, *Le origini del madrigale cinquecentesco* (Turin, 1912).

MADROÑA, mȧ-drō′nyȧ. A California tree. See Arbutus.

MADSEN, mȧd′sĕn, Thorwald Johannes Marius (1870–). A Danish bacteriologist. He was born in Copenhagen, the son of V. H. O. Madsen, a major general who was Danish Minister of War in 1901. Educated at the University of Copenhagen, he was assistant in the university bacteriological laboratory (1894–1902) and after eight years in the State Serum Institute at Copenhagen became its director in 1910 and adviser in bacteriology and epidemiology to the Department of Health. He made special studies on active and passive immunization and on toxins and antitoxins, holding (with Arrhenius and against Ehrlich) that the chemical combination of toxin and antitoxin was a very loose one, in *Physical Chemistry applied to the Study of Toxins and Antitoxins* (1902). He edited the *Contributions de l'institut sérothérapeutique de l'état danois*.

MAD TOM. Any of several small catfish of the genus *Schilbeodes*, common throughout the fresh waters of the Eastern United States, especially southward. They have elongate bodies and very thick skins, and have habits similar to those of darters, "lying on the bottom among rocks and weeds and delighting in small, rocky brooks." The best-known species is *Schilbeodes insignis*, which reaches a length of nearly a foot; it is dark brown, somewhat mottled, and all the fins are broadly dark-edged. Another much mottled form is *Schilbeodes miurus*. These catfish have large poison glands, and a wound from the pectoral spine is painful, though not serious. See Catfish, and Plate of Catfish.

MADURA, mȧ-dōō′rȧ. The capital of a district in Madras, British India, the ancient capital of the Pandyan Kingdom, 270 miles (344 by rail) southwest of Madras (Map: India, C 8). It is celebrated for some of the finest examples of Hindu architecture in existence. It has wide and regular streets and large market places, and until recently was surrounded by a double wall with 72 towers and an encircling ditch from 60 to 70 feet wide; the dwelling houses, however, are poor. The Temple of Minakshi or Fish Mother, in the centre of the city, is one of the finest Dravidian buildings in India. It is said to have been partially destroyed in the flood of Menu, and to have been rebuilt by Sekhara Pandyan in the second or third century; to have been nearly destroyed during the second Mohammedan conquest in the fourteenth century, and renewed by Viswanatha Nayak. Its present splendor is due to Tirumulla Nayak, the last Rajah, who reigned 1622–62. The outer wall of the temple is a parallelogram of 847 by 729 feet, within which are 50 buildings devoted to the various purposes of the temple worship. The wall is of granite with a parapet of brick and is 37 feet high. The main entrances are by four *gopuras*, or gateways, 30 feet high, through pyramidical towers 50 or 60 feet wide at the base which rise in 11 stories to the height of 150 feet and are entirely covered with the most intricate carvings of gods and heroes of mythology, all painted and gilded. One choultry, or rest house, within the inclosure, built by Tirumulla Nayak, is 332 feet by 105, the roof supported by 162 columns, many of them wrought from a single stone. Fifty-four of these columns are 30 feet high, of two stones fitted face to face so as to look like one solid block 4½ feet thick, carved on all sides with life-size figures in full relief or in bas-relief. This hall is said to have cost $5,000,000. The granite roof in the Sahasrastambha Mandapam, or Hall of One Thousand Pillars, is supported in reality by 997 columns, and the columns in the whole temple number 10,000. A palace built by Tirumulla Nayak has been restored and is an edifice of considerable magnificence. Madura was the political and religious capital of south India from the earliest time. It is the Modura of Ptolemy, and in the time of Augustus its King sent ambassadors to Rome. Early in the Christian era a college was founded here for the cultivation of Tamil literature, and was distinguished for the learning of its professors. The care taken to preserve the purity of the language is in evidence to this day. The last sovereign, Queen Menakshi Amman, was dethroned by Chunder Sahib in 1736; from 1740 to 1760 the city was repeatedly besieged. A Roman Catholic mission, established here early in the seventeenth century, flourished until the English occupation. In 1837 it was reëstablished and is a prosperous institution. An American Protestant mission, to which a hospital is attached, was established in 1834. Two colleges and three schools receive state aid, and there are several literary institutes. Cotton and coffee mills and cigar factories are the chief industrial establishments, supplying a domestic trade. Pop., 1891, 87,428; 1901, 105,984; 1911, 134,130.

MADURA. An island of the Malay Archipelago, belonging to Holland, and separated by a narrow strait from the northeast coast of Java (Map: East Indies, D 7). Its area is 1726 square miles, including a number of small dependent islands, 2090 square miles; it is mountainous, with a not very fertile and poorly cultivated soil. Cattle raising is the chief occupation of the inhabitants. The production of salt is an important industry, but is entirely in the hands of the government; petroleum is also found. The island is administered by a Dutch Resident, subject to the general government of Java. The capital is Pamekasan, with a population (1905) of 8407, and the largest city is Sumenep (pop., 22,110). The population of the island, with its minor dependencies, was, in 1905, 1,843,601, of whom 621 were Europeans, 4734 Chinese, 1873 other foreigners, and the rest natives professing Mohammedanism. The natives of Madura resemble closely the Javanese proper, with whom they are allied linguistically and somatically. The Madurese are stronger and more active than the Javanese.

MADURA FOOT, or Mycetoma. This is also known as the fungus disease of India and is caused by invasion of the tissues of the foot by a vegetable parasitic fungus, *Streptothrix mycetoma*. The disease is localized in the foot, which becomes studded with cysts and open sores and sinuses which discharge an oily, thin, purulent fluid having an offensive odor. The foot becomes swollen and œdematous. In the early stages of the disease removal of the diseased tissue by scraping or excision may bring about a cure, but as a rule amputation is the only remedy. Consult Osler, *Modern Medicine* (New York, 1914).

MADVIG, mäd′vĭg, Johan Nikolai (1804–86). A Danish classical scholar, born at Svanike, in the island of Bornholm, Aug. 7, 1804. He was educated at the University of Copenhagen and obtained there the professorship of the Latin language and literature when he was only 25 years of age. Although his life was chiefly devoted to philological studies and to the careful editing of classical works, he held very important official positions in Denmark, where he was Minister of Public Worship from 1848 to 1852 and Director of Public Instruction in 1852. He was repeatedly elected to the National Legislature, was several times president of the Folkething, and was leader of the National Liberal party. He published a *Glance at the Constitutions of Antiquity;* an admirable edition of Cicero, *De Finibus* (1839); a *Latin Grammar for Schools* (1841, 1857, 1867; translated into English by Woods, then, after five editions in England, by Thacher, Boston, 1888); *Greek Syntax* (1846); *Adversaria Critica ad Scriptores Græcos et Latinos* (1871–73); *The Creation, Development, and Life of Language; Opuscula Academica* (1834–42); *Emendationes Livianæ* (1860, 1877); a text of Livy (1861–66); *Kleine philologische Schriften* (1875); and other works. Madvig exercised great influence by his writings upon both German and American scholarship, especially by his Latin Grammar and by his critical observations on various Latin authors, especially Cicero and Livy. He did much to further textual criticism (q.v.) by insisting that manuscripts of an author were to be valued according to their relation to the archetype of that author. His last works were a dissertation on *The Constitution of the Roman State* (1882) and an *Autobiography* which appeared in 1887, the year following his death, which occurred Dec. 12, 1886. Consult Henry Nettleship, *Lectures and Essays, Second Series*, 1–23 (Oxford, 1895), and J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

MAD WORLD, My Masters, A. 1. A merry dialogue between two travelers by Nicholas Breton (1603). 2. A play by Middleton (1608), a vivacious comedy of a young scamp and an old grandfather. This was partly adapted by Mrs. Aphra Behn in her *City Heiress* (1682), and used by Charles Johnson in *Country Lasses* (1715).

MÆAN′DER (Lat., from Gk. *Μαίανδρος*, *Maiandros*, now called Menderes). The ancient name of a river of Asia Minor, rising near Celænæ in Phrygia and flowing in a southwest direction into the Icarian Sea at Miletus (Map: Greece, Ancient, F 3). It was famous in classic times for its numerous windings, and thus gave its name to the well-known and beautiful patterns known as *meanders*, so common in Greek ornamentation. Its course is 240 miles, during which it receives many tributaries. It is a narrow and deep stream, but frequently overflows its banks, and by means of alluvial deposits has extended its channel considerably. It is navigable for small vessels only.

MÆCENAS, mē̇-sē′nȧs, Gaius Cilnius. A Roman statesman, celebrated for his skill as administrator and diplomat, and even more for his patronage of letters. He was born between 73 and 63 B.C., perhaps at Arretium. His family was of Etruscan origin and claimed royal descent. He received an excellent education and was familiar with Greek and Roman literature. He first appeared in public life after the assassination of Julius Cæsar (44 B.C.), as the friend and adviser of Octavian, about 40 B.C. He had, it is clear, a talent for private diplomacy and was employed mainly in that capacity. He "arranged" a marriage between Octavian and Scribonia, made up (temporarily) the differences between Octavian and Antony, and brought about the peace of Brundisium (40 B.C.). Another important mission, in which he was mediator between Octavian and Antony, either in the fall of 38 or in the spring of 37, is alluded to by Horace in his famous account of his journey to Brundisium (*Sermones*, i, 5). In 36 B.C. he was in Sicily, helping Octavian, as usual. Five years later, when the latter was fighting the decisive battle of Actium with his rival Antony and Cleopatra, Mæcenas proved himself a vigilant governor of Rome by crushing a conspiracy of the younger Lepidus and thereby preventing a second civil war. When Octavian became Emperor under the title of Augustus (a step which he is said to have taken by the advice of Mæcenas, who was profoundly impressed with the necessity of a strong government to repress the anarchic elements of the period), Mæcenas was appointed administrator of all Italy. The nature and the extent of his official power are not very precisely understood, but it was undoubtedly great, though the influence and authority of Mæcenas are to be estimated rather from his intimacy with the Emperor than from his mere position as a public official. This intimacy continued uninterrupted for many years; but some time before 16 B.C. it was ruptured, from causes which cannot now be ascertained. No enmity, however, ensued. Mæcenas was a thoroughly sincere Imperialist. He had a belief in the value of an established government; and, when he found that he no longer retained the confidence of his sovereign, he did not lapse into a conspirator, but, as a modern minister might do, retired into the obscurity of private life. Literature and the society of literary men now occupied all his time. He was immensely rich, and kept an open table for men of parts at his fine house on the Esquiline Hill. His patronage of men of letters was due to his keen-sighted vision of the extent to which men of letters might make the new order of things, represented by the personal government of Octavian, palatable to the better classes. Mæcenas' relations with Horace (q.v.) especially were of the most cordial nature and equally honorable to both. It was he that gave to the poet the famous Sabine farm of which Horace sings so exquisitely in his *Odes*. It was he, too, that requested Vergil to write his *Georgics*. The poet Propertius was also one of Mæcenas' more intimate friends. As far as personal morality went, Mæcenas was a thorough pagan; he dressed effeminately, had a passion for theatrical entertainments, and gave great attention to cookery and gardening. It does not surprise us to find that he was a valetudinarian and a hypochondriac. He died childless in 8 B.C. Consult: for the preserved fragments of his verses, Baehrens, *Fragmenta Poetarum Romanorum* (Leipzig, 1886), and Harder, *Fragmenta des Mäcenas* (Berlin, 1889); also: V. Gardthausen, *Augustus und seine Zeit*, vol. i (Leipzig, 1891); W. Y. Sellar, *Horace and the Elegiac Poets* (Oxford, 1892); Charles Knapp, *Vergil*, Introduction (Chicago, 1901); Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (3d ed., Munich, 1911).

MÆCENAS, Gardens of (Lat. *Horti Mæcenatiani* or *Horti Mæcenatis*). A magnificent pleasure ground laid out under Augustus by his minister Mæcenas (q.v.), who planned the work in order to do away with the pestilential condition of the popular cemetery on the Esquiline Hill (q.v.). Mæcenas covered the whole district, outside the Agger of Servius, north and south of the Porta Esquilina, with a layer of pure earth 20 to 25 feet deep and made the new ground into a garden. The effect on the city's health was marked, and is celebrated by Horace in *Sermones*, i, 8 (see notes in editions of Horace).

In the gardens were a palace and a tower, from which, according to Suetonius, Nero watched the burning of the city in 64. The extant remains consist of some rooms paved with mosaic, and a fine large building on the Via Merulana, once called an auditorium, but probably a conservatory. This is a hall, half underground, and has seven curved steps in the apse, arranged like the steps or seats of a theatre. Each wall is pierced by six niches, once covered with finely executed landscapes, which have now faded away. Many works of art, in great part portrait busts, have been found on the site of the gardens, and are preserved in the Conservatory Museum. Consult R. A. Lanciani, *Ancient Rome in the Light of Recent Discoveries*, pp. 65–67 (Boston, 1889), and S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911), on p. 465 of which is a photograph of the "auditorium."

MAELAR, mā′lär. A lake of Sweden. See Mälar.

MÆLDUNE, mäl′dōōn. See Maildun.

MAELSTROM, mäl′strom. See Malström.

MÆ′NADS (Gk. *Μαινάδες*, *Mainades*, from *μαίνεσθαι*, *mainesthai*, to rave). A name given to the Bacchantes (q.v.), from their frenzied state in the worship of Dionysus. See Bacchæ; Bacchus.

MÆONIDES, mê-ŏn′ĭ-dēz, or **MÆONIAN SWAN**. A name given to Homer on the basis of the story that he was born at Smyrna in Lydia (q.v.), once called Mæonia.

MÆO′TIS PA′LUS. An ancient name of the Sea of Azov, also called Cimmerium Mare and Bosporicum Mare.

MAERCKER, mĕr′kĕr, Maximilian (1842–1901). A German agricultural chemist, born at Kalbe-an-der-Saale. He studied at Greifswald and Tübingen, in 1866 was appointed assistant at the Brunswick agricultural experiment station, in 1867 at that of Weende-Göttingen. In 1871 he became director of the experiment station of the Central Agricultural Union for the Province of Saxony at Halle, and in 1872 professor of agricultural chemistry in the university. He conducted extensive experiments on the value and use of fertilizers for all kinds of farm crops, the culture of various crops, and the feeding of live stock; gave much attention to the improvement of the sugar beet and its culture; and was an authority on alcohol manufacture and the distilling industry, his *Handbuch des Spiritusfabrikation* (6th ed., 1894) being a standard work. In 1893, under commission from the Ministry for Agriculture, he studied American agricultural methods and institutions as displayed at the Chicago Exposition and prepared a report, *Amerikanische Landwirtschaft und landwirtschaftliches Versuchs- und Unterrichtswesen* (1905). In this he recommended the establishment of an experimental farm of the American type, and such a farm, the first in Germany, was instituted under his direction in 1895 at Lauchstädt, near Halle. A monument to him was erected in Halle in 1905. He also wrote, besides contributions to periodicals, *Die Kalisalze und ihre Anwendung in der Landwirtschaft* (1880); *Die Kalidungung in ihrem Wert für die Erhebung und Verbilligung der landwirtschaftlichen Produktions* (2d ed., 1894); and a long list of reports and addresses. Consult Behrend-Hohenheim, "Max Maercker, Ein Rückblick," in the *Landwirtschaftliche Jahrbücher*, vol. xxxi (Berlin, 1902).

MAERLANT, mär′lȧnt, Jacob de Coster van (c.1235–c.1291). A Flemish poet, called, not unjustly, the father of Dutch literature, for in him are combined its learning, its practical sense, its didactic zeal, and its aversion to chivalrous ideals. He was born near Bruges and died at Damme, near Bruges. At first Maerlant yielded to the universal vogue of the romance of chivalry. He was parish clerk at Maerlant when he adapted from the French an *Alexander* (1257; printed 1860–61 and 1882) and a *History of Troy* (1264, printed in part, 1874 and 1891). He also rendered into Dutch a *History of the Graal* and the *Book of Merlin* (5th ed., 1883). Then, moving to Damme and becoming chancellery clerk, he first turned his mind to present social conditions in three strophic poems, called the *First*, *Second*, and *Third Martin* (printed 1496 and 1880), and then began the series of didactic works with which his name is especially associated by *The Secret of Secrets*, a treatise on government (printed 1838 and 1844). *Flowers of Nature* (printed 1878) followed, an adaptation of Cantimpré's Latin *De Rerum Natura*. Then came the most famous of his books, *The Rhymed Bible*, based on the *Scholastica* of Comestor with an addition from Josephus on the fall of Jerusalem (1271; printed 1858–69), a work that brought him into conflict with some of the clergy, though the Franciscans soon after employed him to translate into Dutch St. Bonaventure's *Life of Saint Francis* (printed 1848). He then (1283) began his most extensive work, a popularization of the *Mirror of History* by

Vincent of Beauvais (printed 1857–63), which he did not live to finish. He wrote also in his last years a fine crusader's song, *Of the Land Over-Sea.* Maerlant was in literature the representative of the national element among his countrymen against French influence, brought in by the court and nobility. All his writings were in verse. Consult: Serrure, *J. van Maerlant, en zijne werken* (Ghent, 1867); J. te Winkel, *Maerlants Werken, etc.* (Leyden, 1877; 2d ed., Ghent, 1892), and G. Kalff, *Geschiedenis der nederlandsche Letterkunde,* part i (Leyden, 1887); J. P. W. Crawford, "The Catalan Mascarón, and an Episode in Jacob van Maerlant's Merlijn," in *Modern Language Association, Publication,* vol. xxvi (Cambridge, Mass., 1911).

MAES, or **MAAS,** mäs, Nicolas (1632–93). A Dutch genre and portrait painter. He was born at Dordrecht and was a pupil of Rembrandt. The genre paintings of his early period, executed in the manner of Rembrandt, are real masterpieces. Among these are "The Eavesdropper" (Six Gallery, Amsterdam); "Old Woman Spinning"; "Girl at a Window" and "Grace" (Rijks-Museum, Amsterdam); the "Cradle," "Dutch Housewife," and "Idle Servant" (National Gallery, London); "Killing Pigs" and a "Bishop Reading" (Berlin Museum); and "Saying Grace" (Louvre). Maes also painted a number of religious pictures. A good example is "Hagar's Farewell," which has long been labeled a Rembrandt (collection of the Earl of Denbigh). During his residence at Antwerp (1660–65) he adopted a smooth and finished style, showing the influence of Van Dyck. His work became uninteresting and spiritless, as may be seen from his later portraits at Amsterdam and Rotterdam. In 1906 the Metropolitan Museum, New York, acquired an excellent example of Maes's work, the portrait of an elderly woman in black, and in 1914 (in the Altman collection) "Young Girl Peeling an Apple." Consult Bode, *Great Masters of Dutch and Flemish Painting* (Berlin, 1906; Eng. trans., 1909).

MAESHOWE, mās′hou. An artificial tumulus, situated on the island of Orkney, about 9 miles west of Kirkwall and a little more than a mile from the standing stones of Stennis (q.v.).

MAESTEG, mīs′tĕg. A town in Glamorganshire, Wales, 8 miles southeast of Neath. It is engaged chiefly in coal mining. Pop., 1901, 15,000; 1911, 24,977.

MAESTOSO, mä′ĕ-stō′sȯ. An Italian term in music, meaning 'with majesty or dignity.'

MAESTRAL. See Mistral.

MAESTRICHT, or **MAASTRICHT,** mäs′trĭKt (Lat., *Trajectum ad Mosam,* i.e., Meuse crossing). The capital of the Province of Limburg, Netherlands. It is situated 19 miles north of Liége, Belgium, on the left bank of the Meuse, over which a stone bridge, built in 1683, leads to the suburb of Wijk, where the railroad station is (Map: Netherlands, D 4). It is well built and has several interesting buildings. On the great market place stands the beautiful town hall, with its clock tower, dating from 1659 to 1664. The building contains several Dutch paintings and fine tapestries. The Hoofdkerk, or church of St. Servatius, built partly in the Romanesque, partly in the Gothic style, is the oldest church in the Netherlands. It has an altarpiece by Van Dyck. Before the high altar is the reliquary of St. Servatius, nearly 6 feet in length by 2½ high, built in the form of a church of gilded and enameled copper and filigree work. It dates from the twelfth century and is unique. The church treasury also contains some interesting antiquities and fourth-century objects belonging to Servatius, including a key of electrum. The town has a number of other churches of singular interest to the archæologist. The town has a library with the provincial archives, an athenæum, and several technical schools. Probably the most remarkable attraction of the neighborhood is the Petersburg sandstone quarries, worked from Roman times and consisting of a labyrinth of subterranean passages extending over a vast area. The chief industries of the town consist of brandy making and beer brewing, together with the manufacture of tobacco and cigars, woolen goods, glass, earthernware, soap, paper, and arms.

Maestricht was early the seat of a bishop and was in the latter part of the Middle Ages in the joint possession of the dukes of Brabant and the bishops of Liége. Owing to its strategical position on the frontier, it has often borne the brunt of war. In 1579 it was captured and sacked by the Spaniards under the Duke of Parma, and thousands of its inhabitants were massacred. It was captured by Prince Frederick Henry of Orange in 1632, and in 1673, 1748, and 1794 by the French. In the Belgian revolution of 1830 it was almost the only town along the frontier which withstood the attack of the insurgents. Its fortifications have been razed, but its garrison is still maintained. Pop., 1900, 34,220; 1912, 38,611.

MAESTRICHT BEDS. An important formation of soft yellowish limestone occurring at Maestricht in Holland, abounding in the remains of corals and Bryozoa, sometimes, indeed, entirely made up of them. The fossils are peculiar and quite distinct from Tertiary species. It overlies the chalk stratigraphically.

MAESTRO, mȧ-ĕs′trȯ (It., master). An Italian term, used in the same general sense as the English word "master." The *maestro al cembalo* was the conductor of opera in Italy during the first half of the nineteenth century. He did not direct by means of a bâton, but played the cembalo (piano) and directed very much as the pianist does to-day in a performance of chamber music for piano and strings. Rossini, Bellini, Donizetti, all directed their works from the cembalo. (See Conductor.) *Maestro di capella* is the conductor and trainer of a choir; *maestro dei putti,* the conductor of the boys' choir at St. Peter's in Rome.

MAETERLINCK, mä′tĕr-lĭnk, *Fr. pron.* mȧ′tĕr′lăN′, Georgette Leblanc (?–). The wife of Maurice Maeterlinck and sister of Maurice Leblanc (qq.v.). She was born at Rouen and became well known as a tragic and emotional actress. Before her marriage, in 1901, she had been a member of the Comédie Française. She created the parts of Charlotte Corday, Monna Vanna, Télaire in the *Castor et Pollux* of Rameau, and Marguerite in Boito's *Mefistofele.* Subsequently she played in a number of her husband's dramas. When a notable performance of *Macbeth* was given at the Maeterlinck home, the historic Abbaye de Saint-Wandrille, Madame Maeterlinck performed the part of Lady Macbeth. A. Teixeira de Mattos made translations of her writings under the titles *The Blue Bird for Children* (1913); *The Girl who Found the Blue Bird* (Helen Keller)

(1914); *The Choice of Life* (1914)—all published in New York.

MAETERLINCK, Maurice (1862–). A Belgian poet, born Aug. 29, 1862, in Ghent. He studied some time in a Jesuit school, then pursued philosophy and law. In 1887 he became a barrister, but in 1896 he settled as a man of letters in Paris. He first wrote *Serres chaudes* (1889) and added to these verses *Douze chansons* (1896). One of these betters an inspiration which Rossetti, in "An Old Song Ended," had got from Ophelia's song in *Hamlet* (Act. iv, Scene 1). His plays—*La princesse Maleine* (1889); *Les aveugles* (1890); *L'Intruse* (1890); *Les sept princesses* (1891); *Pelléas et Mélisande* (1892); *Alladine et Palomides: Intérieur* (1894); *Mort de Tintagiles* (1894); *Aglavaine et Sélysette* (1896); *Sœur Béatrice* and *Ariane et Barbebleue* (1899); *Monna Vanna* (1902); *Joyzelle* (1903); *Le Miracle de St. Antoine* (1905); *L'Oiseau Bleu* (1909), played in the United States as *The Blue Bird; Marie Magdeleine* (1910)—are dramatic in form, but for the most part their mystic quality greatly lessens their dramatic effect. Maeterlinck's spirit is imbued in mysteries. He is symbolistic, though by no means the earliest modern symbolist. He broods over death and sees life with poetic rather than accurately analytic vision. He lives in a dreamy atmosphere, and the puppets in his dramas are rather such stuff as dreams are made of than men and women. Without passion or will, enthralled by Maeterlinck's spirituality, they wander blindly. They are either ghosts or marionettes. It is natural, therefore, that Maeterlinck should appeal not to the public in general, but rather to a special school of admirers who have studied his idiosyncrasies. To the thinking of many critics Maeterlinck is best in his essays. *Le trésor des humbles* (1896), *La sagesse et la destinée* (1898), and Maeterlinck's *Introduction* to his translation of Ruysbroeck's *L'Ornement des noces spirituelles* express Maeterlinck's mystic philosophy. *La vie des abeilles*, translated by Sutro (New York, 1902), is an artist's study of bee life. Here Maeterlinck's sensuous outlook on life, his painter's vision, has no need of psychology; for he is dealing with throngs rather than with individuals, yet there is in his setting forth of the bee's activity, intelligence, instinct, and beauty a precision which evidences first-hand knowledge. Later studies are *Le temple enseveli* (1902); *Le double jardin* (1904); *Mon chien* (1906), which again reveals sympathetic intuition into animal life; *L'intelligence des fleurs* (1907); and *La mort* (1913). His dramas, which were translated by Richard Hovey (New York, 1896), show the influence of the Elizabethan playwrights. Their weird unreality suggests such writers as Villiers de l'Isle-Adam and De Quincey, Rossetti, and Poe, as well as mystic writers of bygone ages. A great many of Maeterlinck's later dramas and essays have been translated by Alexander Teixeira de Mattos and published in New York. In 1911 Maeterlinck was awarded the Nobel prize for literature, and in 1915 he received from the Société des Gens de Lettres one of the two prizes established by Prince Bonaparte. Consult: W. L. Courtney, *The Development of M. Maeterlinck* (London, 1904); M. J. Moses, *Maurice Maeterlinck: A Study* (New York, 1911); E. Thomas, *Maurice Maeterlinck* (ib., 1911); J. Bethell, *The Life and Works of Maurice Maeterlinck* (ib., 1913); Archibald Henderson, *European Dramatists* (Cincinnati, 1913); E. E. Slosson, *Major Prophets of To-Day* (Boston, 1914); G. F. Sturgis, *The Psychology of Maeterlinck as Shown in his Dramas* (ib., 1914).

MÆVIUS, mē′vĭ-ŭs. See Bavius and Mævius.

MAFEKING, măf′ĕ-kĭng. A town of British South Africa, the seat of the administration of the Bechuanaland Protectorate, situated near the west frontier of the Transvaal Province, 870 miles northeast of Cape Town and 4194 feet above sea level (Map: Cape of Good Hope, G 5). It became famous during the Boer-British War of 1899–1902 as the place where the British, under Sir Robert Baden-Powell, were besieged by the Boers under Cronje from Oct. 11, 1899, to May 18, 1900. Mafeking is the headquarters of the railroad system between Kimberly and Bulawayo and has large railroad workshops. There are three considerable gold fields within a radius of 30 miles of the town, which is the chief trading and distributing centre for Bechuanaland and the western Transvaal. The chief buildings are the town hall (1904), the Masonic Temple, the hospital, and the Anglican Memorial Church. Pop., 1911, 1404.

MAFFEI, mȧf-fā′ē, Andrea (1800–85). An Italian poet, born at Riva di Trento. He became known by his translations from German and English, among these being the complete dramatic works of Schiller (1844) and Milton's *Paradise Lost* (1857). He also translated several poems of Byron and Moore, some of Goethe's works, and Shakespeare's *Macbeth*, *Othello*, and *The Tempest* (1869). His original volumes are *Dal Benaco* (1854) and a larger collection of poetry, *Versi editi ed inediti* (1858–60). Consult Benvenuti, *A. Maffei, poeta originale e traduttore* (Trent, 1911).

MAFFEI, Giovanni Pietro (1536–1603). An Italian Jesuit historian, born in Bergamo. He was professor of eloquence at Genoa in 1563 and was made secretary of the Republic in the following year. Later he became a Jesuit (1565) and taught rhetoric in the Jesuit college at Rome. He is best known for his monumental *Historiarum Indicarum Libri XVI* (1588; best ed., Cologne, 1593), a valuable work, which occupied him for 12 years, and for which he gathered most of his material in Portugal. An edition of his Latin works was published at Bergamo in 1747.

MAFFEI, Scipione, Marchese (1675–1755). An Italian dramatist and scholar, born at Verona, June 1, 1675. He received his training with the Jesuits at Parma and then spent some time in the army under his brother Alessandro, a general in the Bavarian service, taking part in the battle of Höchstädt (1704). After his return to Italy he published the book *Della scienza cavalleresca* (Rome, 1710), in which he censured the practice of dueling. With two others he started in 1710 the *Giornale dei letterati*. Interested in the Italian stage of the Cinquecento, he prepared an edition of some of its best plays and prefixed thereto a dissertation of his own in the hope of improving the Italian drama, slavish in its imitation of Greek forms. But he did still more for the native theatre by composing his *Merope*, the first Italian tragedy of incontestable excellence, which was performed in 1713, printed at Venice, 1714, and frequently reprinted. Here he strives to attain the severity of the Greek, in contrast to the amorous insipidity of the contemporary treatment of this theme. In spite of numerous faults it has simplicity of style, and the emotions represented are frequently natural. It was translated into several foreign languages, and gave the type to which Italian tragedy of the eighteenth century conforms. Resembling the French tragedies in structure, it gave impetus to the tendency, already noticeable, which Maffei had striven to combat, to imitation of the French stage. It seems that Voltaire at first meant to translate it into French and only later decided to write an independent drama. The French writer did, however, imitate some scenes of the Italian work, and a bitter controversy arose between the two authors. Against an enemy of the stage, the cleric Concina, he directed the *Trattato de' teatri antichi e moderni,* which received the sanction of Pope Benedict XIV. Maffei's erudition revealed itself in a number of treatises, e.g., in the *Istoria diplomatica* (Mantua, 1727), the *Verona illustrata* (Verona, 1732), and the *Galliæ Antiquitates,* which he published at Paris (1733), after a journey of investigation made through Provence. While in France he studied the Jansenistic movement and dealt with it in his *Istoria teologica, etc.* (Trent, 1742). He attacked current prejudices in the *Dell' impiego del denaro* (1746), in which he demonstrated that loans on interest are not prohibited by moral law or by the Scriptures, and he renewed his attack in the *Arte magica* (1749–54). Works on physics, entomology, and other subjects show his scientific attainments. Consult: Maffei's *Opere* (21 vols., Venice, 1790) and the selected *Opusculi letterari* (ib., 1829, and Milan, 1844); Pindemonte, "Elogio del marchese Scipione Maffei," in the *Elogie di letterati italiani* (Florence, 1859); Giuliari, "Bibliografia maffeiana," in the *Propugnatore* for 1885, and A. Parducci, *La tragedia classica italiana del secolo XVIII anteriore all' Alfieri* (Rocca San Casciano, 1902).

MAFFIA. See Mafia.

MAF′FIT, John Newland (1819–86). An American naval officer, born at sea. He entered the United States navy as a midshipman in 1832 and was promoted to a lieutenancy in 1848. In May, 1861, he withdrew from the Federal service and entered that of the Confederacy. The next year he was placed in command of the *Oreto,* a steamer that had been built for the South at Liverpool. He carried the vessel to the island of Green Key, where he renamed her the *Florida* and took on board guns and ammunition that had been sent from Nassau. After a visit to Mobile he set out in January, 1863, on a long and adventurous cruise, in the course of which he captured a great many prizes, one of them alone being of the value of $1,500,000. Towards the end of the year, however, while his vessel was being repaired in the port of Brest, Maffit's health gave way, and he resigned his command. He died at Wilmington, N. C.

MAFFLEAN. See Paleolithic Period.

MAFIA, mä′fē-ȧ. A secret organization, especially prevalent in Sicily. Its origin is shrouded in mystery, but probably it arose gradually during the centuries of oppression under which Sicily and other parts of Italy suffered. The object of this society is to guarantee its members, who are known as Mafiosi, immunity for any crimes which they may commit. It is divided into sections, and there are passwords to enable members to recognize each other. There is a distinction between the Mafiosi of the mountains and those of the commercial cities. In the mountains the crimes are of the ruder sort, while along the coast and in the cities numerous assassinations and other terrible crimes have been perpetrated under the protection afforded by the Mafia. The essence of the constitution of the Mafia has been declared to be: ready, passive, and constant obedience to the head of the band; absolute silence as to the composition and enterprises of the band; material, moral, and pecuniary aid to all members, especially when arrested; never to have recourse to legal authority, but to refer all disputes to the leader of the band. The penalty for a violation of any of these obligations is invariably death. Members are subjected to an elaborate initiation, and the society claims in Sicily as members people from all ranks of society, and the whole of the island is still terrorized by the Mafia. General meetings are frequently held at the great cattle fairs, and the members of every grade assemble and adjust their reciprocal interests, devise their criminal projects, and plan their execution. The Italian government has frequently sought to suppress the Mafia, which in late years seems to be allied with anarchistic movements. In 1902 the government succeeded in convicting one of the leaders, Baron Palizzolo, a member of the National Legislature, for the murder of Marquis Notarbartolo, by transferring the trial to northern Italy. An account of this affair is to be found in *Die Zukunft* (Berlin, 1900). The baneful influence of the Mafia has also made itself felt several times in the United States, notably in New Orleans in 1890, where it was suspected of having caused the murder of the chief of police, and led to a riotous demonstration on the part of the citizens which resulted in the death of 11 Italians who were held in prisons under suspicion of complicity in the crime. A similar society is the Camorra (q.v.), which has attracted great attention. Consult: A. Vizzini, *La Mafia* (Rome, 1880); Giuseppe Alongi, *La Mafia* (Turin, 1886; 2d ed., Palermo, 1904); *Chambers's Journal,* vol. lxix (London, 1892); A. Cutrera, *La Mafia e i Mafiosi* (Palermo, 1900); E. C. Calou, *La Mafia* (Madrid, 1905).

MAGADAN. See Magdala.

MAGADHA, mŭg′hä-dȧ. One of the principal kingdoms of India when Alexander the Great invaded the country (327 B.C.). It comprised the larger part of Southern and Central India, and its power lasted till about 450 A.D. The capital of Magadha was Pataliputra, on the Ganges, which probably occupied the site of the present Patna. Seleukos, one of Alexander's generals, to whom Bactria was given, including the provinces on the Indus, attempted conquests beyond that river and was involved in war with the founder of the Maurya dynasty, Chandragupta, King of Magadha, called by the Greeks Sandrocottus (q.v.), who reigned from 315 to about 291 B.C. One of the Magadha kings, Bimbisara, is famous as the friend and patron of Buddha when he began his mission as a religious teacher. Consult M. C. Duff, *The Chronology of India* (London, 1899).

MAGADINO, mä′gȧ-dē′nō. A town in Switzerland on Lake Maggiore (q.v.).

MAGALHÃES, mȧ-gȧ-lyä′ĕNsh, Domingos José Gonçalves de (1811–82). A Brazilian writer, born in Rio de Janeiro, 1811, of an old Portuguese family. He was educated as a physician. In 1836 he was attached to the Brazilian Embassy at Paris. Returning to Rio in 1838, he became professor of philosophy in the Imperial College of Pedro II and then successively member of the Chamber of Deputies, chargé d'affaires at the courts of Turin and Naples, and Minister to Austria (1859), where he remained until 1867, when he became Ambassador at Washington (1867–71), whence he returned to spend several years at home. Finally he undertook the embassy at Rome and died there, July 10, 1882. Having begun as a classicist in his *Poesias* (Rio de Janeiro, 1832), he soon joined the Romantic movement, and between 1830 and 1840 he was one of the chief poets of Brazil. The first really important lyrics are, probably, his *Suspiros poeticos* (Paris, 1836). Mediocre works, and notable chiefly as the first tragedies by a Brazilian, are his *Antonio José* (Rio de Janeiro, 1839), *Olgiato* (ib., 1841), and *Amancia* (1844). The most famous work of Magalhães is the epos *A confederação dos Tamoyos* (Rio de Janeiro, 1857). The elegiac *Mysterios* is of 1857. Of his prose treatises there may be mentioned the *Ensaio sobre a historia litteraria do Brasil* (1836) and the *Factos do espirito humano* (1858). His *obras completas* were published at Paris in 1864 and later. Consult Wolf, *Ueber Dom J. G. de Magalhães* (Vienna, 1862), and id., in *La littérature brésilienne* (Berlin, 1863).

MAGALHÃES, FERNÃO DE (very commonly known by the Spanish form of his name, FERNANDO DE MAGALLANES, anglicized to MAGELLAN) (c.1480–1521). The discoverer of the Strait of Magellan, the first European navigator to sail across the Pacific Ocean, and the first person to circumnavigate the globe. According to certain documents his birthplace was Figueiro in Portuguese Estremadura, but there seems to be still greater evidence of his having been born at Villa de Sabroza, District of Villa Real, Traz os Montes, in Portugal. In any case, his father was Pedro de Magalhães, of a noble or hidalgo family, of the rank known as *nobles de cota y armas* (Portugal's fourth order of nobility). The date is not known. Having served as a page to Leonor, Queen Consort of João II (the Perfect), he entered service under their son, Manoel (the Fortunate), in 1495 and in 1504, as a volunteer, went to India with the first Viceroy, Dom Francisco d'Almeida, whence, after being twice wounded and rendering notable service, he was sent on various expeditions to Sofala, Malacca, Java, and the Spice Islands, in the years 1508–12, returning in this latter year to Portugal, with the grade of captain, that had been conferred upon him in 1510. In the treacherous uprising of the Malays in 1510 he fought bravely and ably, but it was not he who discovered the plot. Shortly after his return to Portugal he was raised to the rank of *fidalgo-escudeiro* (July 14, 1512); and the next year was stationed at Azamor in Morocco, capturing the city in August, being subsequently wounded and lamed for life, and conducting the operations against the Arabs, until he became involved in a dispute over the distribution of booty, which led him to go back to Portugal without the permission of his superiors. This is supposed to have influenced the King in refusing to grant him an increase in his royal allowance, for which he had petitioned, and this refusal in turn led him to forswear his native country and offer his services to the King of Spain in 1517. Magalhães had learned, probably from the captain of some stray trading vessel who had tried his fortunes in the southwestern Atlantic, that there was a water passage opening towards the west. Through influential friends at the Spanish court, chiefly Juan de Aranda and Diego Barbosa (who now became his father-in-law), he gained a hearing from Charles V, and his minister, Juan Rodríguez de Fonseca (the Bishop of Burgos), in which he presented his plans for finding a way westward to the Spice Islands. After many vexatious delays caused by the agents of the Portuguese government and by the Spanish officials who were jealous of the Portuguese mariner, Magalhães and Ruy Faleiro the astronomer signed an agreement with the King, March 22, 1518, by which they were appointed joint captains general and were to receive one twenty-fifth of the clear profits, and the government of any lands they might discover was vested in them and their heirs, with the title of *Adelantados*. Faleiro decided finally not to go, but Magalhães set sail from Seville with a fleet of five vessels, Aug. 10, 1519. In December he was at Rio de Janeiro, and in February, 1520, he reached the entrance to the Rio de la Plata. The next six months were occupied by difficulties with his crews and the loss of one vessel, so that it was Oct. 21, 1520, before he arrived at the entrance to the strait known by his name, but named by him Todos los Santos. A month later, November 28, he completed the passage and entered the Pacific Ocean. One of his vessels had meanwhile deserted him, and after many adventures made its way back to Seville, where it reported the destruction of the fleet. After a smooth and pleasant voyage (whence the name of Pacific given to this ocean), but during which they had suffered unspeakably from scurvy, due to scanty and bad provisions, Magalhães reached the Tiburones Islands in February, 1521, and on March 6 he was at the Ladrones. Ten days later he fetched Samar, and during the next six weeks visited the other islands of the Philippine group. Friendly relations were established with the ruler of the island of Cebú, with whom Magalhães joined his forces in an attack on the natives of the island of Mactán. While conducting a rear-guard defense after his partisans had been routed, Magalhães was killed, April 27, 1521. After this disaster one of the vessels was burnt, and the remaining two proceeded to Tidore, in the Moluccas, where the *Vittoria*, of which Sebastian del Cano had become commander, was refitted for the voyage back to Spain. She sailed Dec. 21, 1521, doubled the Cape of Good Hope on May 19, 1522, and on Monday, Sept. 9, 1522, dropped anchor in Seville Roads, having completed the first voyage around the world. Although Magalhães did not live to complete this particular voyage, he did circumnavigate the globe; for we must bear in mind that on his longest voyage eastward he had reached Banda Island at long. 130° E. of Greenwich, and that when he fell at Mactán Island he had sailed westward to long. 124° E. of Greenwich, thus by six degrees more than completing the circumnavigation. This feat has never been recognized at its full value, which would place it among the four leading achievements in discovery and exploration. Consult: *The First Voyage round the World by Magellan, Translated from the Accounts of Pigafetta, and Other Contemporary Writers . . .* by Lord Stanley of

Alderley for the Hakluyt Society (London, 1874); Diego de Barros Arana, *Vida e viagems de Fernão de Magalhães*, Portuguese translation of the Spanish Life by Fernando de Magalhães Villas Boas (Lisbon, 1881); F. H. H. Guillemard, *Life of Magellan* (London, 1890); *Raccolta di documenti e studi pubblicati nella real commissione colombiana*, vol. iii, part v, edited by Andrea da Mosto for the Ministry of Public Instruction (Rome, 1894); *Magellan's Voyage around the World*, the original text of the Ambrosian manuscript (of Pigafetta), with English translation, notes, bibliography, etc., by J. A. Roberston (3 vols., Cleveland, 1906); F. A. Ober, *Ferdinand Magellan* (New York, 1907); G. M. Towle, *Magellan, First around the World* (Boston, 1914).

MAGALHÃES, FRAY GABRIEL DE (1609–77). A Jesuit missionary to China, born at Pedrogão in Portugal. He went to India in 1634 and to China in 1640, and was treated with great honor by the Emperor. Twice escaping martyrdom, he died peacefully and was honorably buried. He wrote *Nouvelle relation de la Chine*.

MAGALLANES, mä′gȧ-lyä′nås. A territory of Chile, comprising all that part of the country lying south of the forty-seventh parallel, which separates it from the Department of Chiloe (Map: Chile, E 7, 8). It includes the islands off the west and south coasts, and its entire area is estimated at 66,192 square miles. The mainland is a narrow strip of land largely mountainous and with extremely broken coasts, which fall into the sea in rocky and gloomy cliffs, in some places covered with glaciers. Numerous narrow channels enter far into the country, forming many peninsulas. The climate in that part of Chile is extremely damp and stormy, and rains occur during the greater part of the year. There are extensive pine forests, but very little agricultural land. Cattle, horses, and sheep are raised, and there are mines of coal, copper, and gold. Among the chief groups of islands belonging to the territory are the Wellington group, Madre de Dios, Hanover, Queen Adelaide Archipelago, and the western part of Tierra del Fuego. The population of the territory was 5170 in 1895, 17,330 in 1907, and in 1915 was estimated at 23,000, about half of whom live in the capital, Punta Arenas, on the Strait of Magellan.

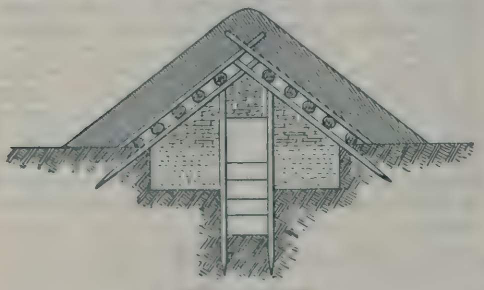
MAGAZINE, măg′ȧ-zēn′ (OF., Fr. *magazin*, It. *magazzino*, from Sp. *magacen*, from Ar. *makhāzin*, pl. of *makhzan*, storehouse, from *khazana*, to store up). The structure or cavity used for the storage of explosives. Where natural or artificial caves occur conveniently near mines or quarries, these are often used as magazines, but usually special buildings are constructed for such storage. All magazines should be cool, dry, clean, well ventilated, bullet proof, and fireproof. They should be constructed of such materials that when their contents are accidentally exploded the materials of which they are formed shall furnish neither burning brands to spread fire nor missiles to injure surrounding persons and property. The material found best suited is sand-cement mortar, consisting of coarse sand 6 parts and cement 1 part, as it offers marked resistance to penetration of rifle bullets and yet on explosion it is blown to a dust. The former characteristic is sought because magazines have frequently been made targets by foolish persons provided with firearms. The location of a magazine is of prime importance. It should be as convenient to the points of use and receipt of the explosives as possible, but sufficiently remote from highways, railways, inhabited buildings, mine buildings, and structures to inflict the minimum of damage in case of accidental explosion of the entire amount of explosive it is designed to carry. Natural or artificial mounds or barricades about a magazine serve to limit its danger. Some 30 years ago Colonel Majendie, H. M. Inspector of Explosives, studied the data of numerous accidental explosions and devised a table of distances that should separate buildings containing explosives from places frequented by man, and this was enacted into a regulation by the English Home Office and served as a model for other countries. Following the Lowell magazine disaster, Massachusetts enacted analogous legislation. More recently the manufacturers of explosives in the United States and the officials of the Bureau of Explosives of the American Railway Association have combined to investigate the data more fully, producing what is known as the American Table of Distances. To become law it must be enacted into legislation by the various States. The results are set forth below:

TABLE OF DISTANCES FOR THE ISOLATION OF MAGAZINES FROM INHABITED STRUCTURES

BARRICADED MAGAZINE		NONBARRICADED MAGAZINE					
Quantity of explosives stored	Proposed American distance	Proposed American distance	Massachusetts distance	Austrian distance	English distance	Italian distance	Prussian distance
Pounds	Feet	Feet	Feet	Feet	Feet	Feet	Feet
50	120	240	270	328	....	...	330
100	180	360	351	328	...	...	330
500	400	800	606	1,640	300	230	495
1,000	530	1,060	861	1,640	450	230	495
5,000	780	1,560	1,716	3,280	960	574	999
10,000	890	1,780	2,166	3,280	1,575	656	999
50,000	1,460	2,920	5,550	.....	5,550	1,640	...
100,000	1,835	3,670	10,500	.....	10,500	1,640	...
500,000	2,755	5,510	.....	.....	.....	.....	...
1,000,000	3,455	6,910	.....	.....	.....	.....	...

Consult: O. Guttmann, *Manufacture of Explosives* (2 vols., New York, 1895); Munroe and Hall, *Primer on Explosives for Coal Miners* (Washington, 1909); C. Hall, *Magazines and Thaw Houses for Explosives* (ib., 1912); C. Hall and others, *Investigations of Explosives Used in Coal Mines* (2d ed., ib., 1912); Hall and Howell, *Selection of Explosives Used in Engineering and Mining Operations* (ib., 1913); Munroe and Hall, *Primer on Explosives for Metal Miners and Quarrymen* (Washington, 1915).

Military. Modern military magazines are used as storehouses of powder and ammunition and not as formerly, when they were practically complete armories. General *storage* magazines well out of the range of fire are similar to the magazines used for the storage of explosives for powder factories and on large construction works. These are usually built of noninflammable material, as stone, brick, or concrete blocks of a thickness sufficient to resist penetration by a rifle projectile. They are placed behind hills or in hollows or on islands or otherwise with the idea of reducing to a minimum the damage that an accidental explosion may cause to life and property. In view of the objections to heating them artificially, special provision is made for ventilation to maintain even temperatures, keep down condensation, and to carry off fumes. *Reserve* magazines are near the zone of actual field operations. If not thoroughly protected from hostile fire by their location, ample overhead and horizontal cover should be provided artificially. Their dimensions are dependent on the number and size of guns served and the fighting period for which they are to be supplied. An *expense* magazine is one from which is issued the daily ammunition requirements of the troops to which it belongs. In fortifications—field or coast, permanent or temporary—the expense magazine is within easy access of the point of employment and is an important consideration in the general scheme of defense. Expense magazines are constructed according to the general designs of the fortifications of which they are a part and may be underground or built in the defenses and protected by bombproofs and similar devices. In fieldworks they are small rooms near the guns they serve and must be protected from hostile fire. This protection is normally afforded by building them partially in excavation at a lower level than the guns or by covering them, top, front, and sides, with earth or earth and masonry of thickness about one and a half times as great as the normal penetration of the projectiles to whose fire they will probably be exposed. The passageway to a magazine located in the field of fire should, if possible, contain an angle so that no fragments of a shell exploding outside shall reach the interior. The communications between the expense magazines and the guns should so far as practicable be out of sight of the enemy and protected from his fire, and reasonable protection given between expense and reserve magazines.



A FIELD MAGAZINE.

The design and construction of magazines for *permanent* land and sea-coast fortifications are governed by the general principles of fieldworks and permit of closer calculation as to location, cover, capacity, design, ammunition service, and ventilation. See COAST DEFENSE; FORTIFICATION.

Naval. An establishment used for the storage and handling of gunpowder and other explosives, and the preparation and storage of ammunition for large naval guns. Small-arm ammunition is stored, but not manufactured. Charges for guns are put up in bags ready for use and placed in water-tight tanks; fixed ammunition for smaller guns is loaded and boxed; and shells are loaded with their bursting charges and fitted with fuses and night tracers. The establishment consists of storage houses, filling houses, shell houses, laboratories, offices, etc., and has special facilities for the reception and shipment of ammunition and explosives by rail or water or both.

Ships. The magazines of a vessel of war are compartments designed solely for the storage of gunpowder or other explosives. Fixed ammunition is stowed separately, and projectiles are stowed in shell rooms. Magazines and other ammunition rooms are placed near the bottom of the ship, the tops of the compartments being well below the water line; for turret guns they are arranged about the base of the structure supporting the barbette tower and carrying the ammunition hoists to the turret. Magazines for other guns are placed where most convenient. Modern magazines are more complicated than those intended for the storage of black powder. In order to preserve its highest excellence, smokeless powder requires storage arrangements that will insure only a moderate range of temperature (75°–90° F.) and a nearly constant hygrometric condition. To secure these, magazines are double-walled and lined or lagged with sheet cork or some other nonconductor of heat. Refrigerating machinery maintains a constant temperature, and hydrating or dehydrating apparatus is used to maintain the required atmospheric state. When it is necessary to place magazines near internal sources of heat such as boilers, engines, coal bunkers, and the like, additional precautions are taken. All magazines are fitted with flooding apparatus whereby water may be rapidly admitted to avoid danger in case of fire. This apparatus is arranged for operation at some distance from the magazine. As powder is stored in water-tight tanks, it would not be injured if the magazine were filled with water. Fixed ammunition is usually ruined by submersion. Magazines and passageways leading to them are lighted by electric lamps reached from outside and separated from the interior by thick glass lenses. To prevent fire or bits of blazing material from entering magazines by way of the ammunition tubes or hoists, these terminate in handling rooms or passing rooms beside the magazines. Magazines for the storage of wet guncotton or safety explosives are located below water, usually near the torpedo rooms, but all dry guncotton for torpedo primers is kept above decks except during action or when anticipating it. Daily examinations are made of all magazines, and some are inspected more often. This is done to make certain of the temperature and hygrometric condition, but it also insures safety.

MAGAZINE GUN. See SMALL ARMS.

MAGAZINES. Periodicals devoted either to general literature, art, or science, or to some particular branch of human knowledge. The name magazine was first applied to them as being "storehouses" of varied information. For full account of their history, classes, and scope, see PERIODICAL.

MAGDALA, măg′dȧ-lȧ, or **MAKDALA**. The most strongly fortified town of Abyssinia, situated near the centre of the country, about 120 miles southeast of Gondar (Map: Egypt, D 5). It lies on the summit of an isolated basalt block, a mile square in extent, and with perpendicular sides in some places 2000 feet high. Magdala was stormed by the British forces under Sir Robert Napier on April 13, 1868 (see ABYSSINIA), and was destroyed. It was, however, soon restored to its former position, and is at present of considerable strategic value.

MAG′DALA (Lat., from Gk. Μαγδαλά), more properly **MAG′ADAN** (Gk. Μαγαδάν). The latter is the name in the Revised Version of Matt. xv. 39 given to the place to which Jesus and his disciples went after the feeding of the four thousand. The Authorized Version of this passage reads "Magdala"—a poorly supported variant—and the parallel passage in Mark has "Dalmanutha." Though the identification of the site is not certain, it is generally supposed to be on the western shore of the lake, some 7 miles south of the Plain of Gennesaret and some 3 miles north of Tiberias, near the group of huts which constitute the modern village of El Mejdel. At the upper border of the village is a watchtower, which has probably been reconstructed from an ancient tower, and suggests the derivation of the modern name (Heb. *migdāl* = tower). The puzzle of these three names in the Gospels is not easily resolved. They may refer to three distinct places in the same general district; or "Magadan" may have been turned by some copyist into "Magdala," as Herodotus (ii, 159) turns Megiddo into Magdalum; or El Mejdel being the traditional site of the home of Mary Magdalene, the better-known name, Magdala, may have obscured the less-known Magadan, and so forced its way into the text. In any case, Dalmanutha seems to be a separate place. See DALMANUTHA.

MAG′DALE′NA. The principal river of Colombia (Map: Colombia, C 2). It rises in the southwestern part of the country near the junction of the Central and Eastern Cordilleras of the Andes, and flows northward through the long and narrow valley formed by those two ranges until it enters the Caribbean Sea by two arms separating at the city of Barranquilla. Its total length is over 1000 miles. In its upper course it is an impetuous mountain torrent flowing through narrow, rocky defiles, forming numerous falls and rapids, and even in its lower course it has a very swift current. It is navigable for ocean steamers to the head of the delta at Barranquilla, and for steamers of 300 tons to Honda, 600 miles from its mouth. At Honda there is a series of rapids 20 miles in extent, above which the river again becomes navigable, though with difficulty, for 200 miles farther, to Neiva. Connection is made between the upper and lower courses by a short railroad passing around the rapids of Honda. Owing to the narrowness of its valley the tributaries of the Magdalena are all very short, with the exception of the Cauca (q.v.), whose length equals that of the main river from the point of junction. Until railroads are built the Magdalena will offer practically the only commercial route to the interior of Colombia, and it is now navigated by 40 regular steamers. The river was discovered in 1502 by Rodrigo de Bastidas. Consult H. J. Mozans, *Up the Orinoco and down the Magdalena* (New York, 1910).

MAGDALENA. The northernmost department of Colombia, South America (Map: Colombia, C 2). It is bounded by the Caribbean Sea on the north, Venezuela on the east, the Colombian Department of Santander on the south, and is separated from Bolívar on the west by the Magdalena River. Its area, including the peninsula of Goajira, is 20,463 square miles. The portion along the coast is occupied by the isolated range of Sierra Nevada de Santa Marta, exceeding in altitude 17,000 feet. The peninsula of Goajira is also more or less mountainous and along the eastern frontier is the Sierra de Perija. In the west and south the surface is mostly flat and occasionally swampy and overgrown in parts with dense forests. This part of the country is well watered and affords good grazing land. Bananas, coffee, sugar, cacao, cereals, and cabinet woods are the chief products, and grazing is carried on to some extent; hides and a fine breed of horses are exported. The mineral deposits, including gold, silver, copper, and coal, are believed to be important, but almost entirely neglected. Pop., 1912, 149,547, including about 40,000 uncivilized Indians, many of whom are still irreconcilably hostile to the whites. The capital is Santa Marta (q.v.).

MAGDALENA BAY. A bay and its port of Mexico, situated on the Pacific coast of Lower California (Map: Mexico, C 5). The bay is one of the best harbors on the Pacific coast, affording deep water in a lagoon or inlet 40 miles long and 12 miles wide, inside a sand bar or beach. The town is of slight importance and is the seat of a United States consular agent. It is a rendezvous for vessels of the United States navy detailed for target practice.

MAGDALENA BAY. A bay of northwestern Spitzbergen, discovered by Barents (1596), the scene of many polar activities. A whaling station of the Dutch in the seventeenth century, it was again occupied (1827) as headquarters of Russian sealers. It was the base of David Buchan's expedition (1818) and of the French scientific expedition (1838). Immediately north of it is Danes Island, whence Andrée made his fatal flight by balloon (1897), and where flourished the famous Smeerenberg (q.v.) four centuries ago.

MAGDALEN (mạd′lĭn) **COLLEGE.** One of the most beautiful and famous of Oxford colleges. It was founded as St. Magdalen Hall in 1448, and as the College of St. Mary Magdalen in 1458, by William Patten, better known as William of Waynflete. There were, in 1911–12, a president, 33 fellows, several senior demies, or half fellows (not exceeding 8), 51 junior demies and exhibitioners, 12 tutors, 4 lecturers, 4 chaplains, a choir, college officers, and 202 undergraduates. There is, in connection with the college, Magdalen College School, founded in 1480 as a grammar school preparing for the college and the university, after the manner of Winchester and Eton. Waynflete established also, with his new foundation, four professorships of moral and metaphysical philosophy, chemistry, physiology, and pure mathematics. The buildings, begun in 1475, are among the most beautiful in England. The grounds are extensive, comprising over 100 acres, including a deer park, and are most attractive. Magdalen has, from its foundation, been one of the richest of English colleges. It is rich in historical associations, and is especially to be remembered for the attempt of James II to force a Roman Catholic president on the college, one of the causes of his downfall. The college is still one of the strongest in Oxford. It presents to 40 benefices. Among the more distinguished of its members may be mentioned the grammarian Lily, Cardinal Wolsey, Bishop Foxe, Tyndale, John Lyly, John Hampden, Philpotts, Addison, Gibbon, and Lord Selborne. See OXFORD UNIVERSITY; WOLSEY; JAMES II. Consult: H. A. Wilson, *Magdalen College* (London, 1899), and E. Glasgow, *Sketches of Magdalen College* (ib., 1901).

MAGDALENE (mạd′lĭn) **COLLEGE.** A college at Cambridge University, England. Though nominally dating from 1519, it really began its career in 1542. It was founded by Thomas, Baron Audley, of Walden, and Chancellor of England, on the site of a Benedictine house founded in 1428, called Monks' Hostel, later Buckingham College. It was endowed partly by property in London and partly by spoils of the monasteries. One peculiarity of the foundation is that the master is nominated by the owner of Audley End, the country seat of the founder. The college possesses three libraries, the college library proper, the Peckard library, and the Pepysian library. The latter, contained in a separate building, is the collection of Samuel Pepys (q.v.), the diarist, and contains the manuscripts of his diary, together with other rare and curious documents, including the love letters of Henry VIII to Anne Boleyn, the whole having been given by Pepys, who was a member of the college. There were, in 1911–12, in Magdalene College, a master, a president, 7 fellows and 3 honorary fellows, college officers, lecturers, tutors, 12 scholars and exhibitioners, and 115 undergraduates. The college presents to six livings. Its distinguished members include archbishops Grindal, Usher, and Cranmer. See CAMBRIDGE UNIVERSITY; PEPYS. Consult E. K. Purnell, *Magdalene College* (London, 1904), and Tanner and Duff, *Descriptive Catalogue of the Library of Samuel Pepys* (2 vols., ib., 1914).

MAGDALEN HALL. Once a college at Oxford, England, established by William of Waynflete at the same time as his foundation of Magdalen College (q.v.). It was designed as a school for students previous to their admission to that college, and was presided over by one of the fellows of that foundation. In 1602 it became an independent hall and so remained till 1816, when Magdalen College resumed the premises, transferring the members of the hall to the premises of Hertford College, which were acquired for them in 1822. In 1874 the hall was dissolved and reincorporated as Hertford College. While it was still a hall, Tyndale, the poet Daniel, Lord Clarendon, Sir Henry Vane, and Hobbes were members. See OXFORD UNIVERSITY.

MAG′DALEN ISLANDS. A small group of islands belonging to Quebec and situated near the centre of the Gulf of St. Lawrence, 54 miles northwest of Cape Breton Island (Map: Nova Scotia, H 1). They consist chiefly of rocky knolls, often connected by sand bars, but contain some good soil suitable for agriculture. The inhabitants, who number about 5000, are chiefly supported by the productive cod, herring, and seal fisheries of the neighboring waters.

MAGDEBURG, mäG′de-bụrк; often *Anglicized*, măg′dē-bûrg. The capital of the Province of Saxony, Prussia, a first-class modern fortress, and one of the leading commercial cities of north Germany (Map: Germany, D 2). It is situated principally on the left bank of the Elbe, here divided into three arms, 88 miles by rail west-southwest of Berlin. The portion on the left bank of the Elbe comprises the Altstadt, with its surrounding suburbs of Wilhelmstadt on the west, Neustadt on the north, Sudenburg on the southwest, and Buckau on the southeast. The citadel and the Grosser Werder are on two islands of the Elbe, and Friedrichstadt is on the right bank. The abandoning of the fortifications to the north and south of the old town during the second half of the nineteenth century considerably increased the area of the city, and the additional space has been utilized for modern quarters, as well as for parks. The ancient and irregular plan of the old town has also been somewhat improved. The present fortifications of the city consist of the citadel, a remnant of the old fortifications, and a number of detached forts and redoubts, built in 1866, but since reconstructed and modernized. The old town is intersected from south to north by a wide avenue (Breite Weg), lined with many fine shops and old-fashioned gable houses. The Kaiserstrasse, west of this street, is the principal thoroughfare of the town; while along the banks of the Elbe are two fine esplanades known as the Fürstenwall and the Fürstenüfer. Noteworthy monuments are the one to the Emperor Otho the Great on the Alte Markt, erected by the municipality about 1290 and restored, and that to William I on the Kaiser Wilhelm Platz.

The cathedral of Sts. Maurice and Catharine, erected mainly in 1208–1363 and completed in 1521, is a magnificent Gothic structure, with some traces of the Romanesque. It has a fine polygonal choir, having carved stalls, many monuments and tombs, including those of Otho the Great and his wife Editha. The monument to Archbishop Ernest of Saxony, by Vischer, is especially elaborate, and there is a rare old chapter room. The cathedral contains many ancient objects of interest. The other noteworthy churches are the church of Our Lady, a cruciform Romanesque basilica of the eleventh century, attached to which are some beautiful cloisters, now used as a school; the Gothic church of St. Ulrich; the new church of St. Paul in Wilhelmstadt; and the synagogue. The most notable secular buildings are the Rathaus (1691), the old royal palace, now used as a museum, the administration building, the exchange, the railroad station, and the Reichsbank.

In the way of educational institutions Magdeburg has an agricultural college, a pedagogical seminary, three gymnasia, several Realschulen, an industrial art school, and a technical school. Among the collections are a public library of about 78,000 volumes, the archives of Prussian Saxony, and a museum with collections of paintings, engravings, sculptures, etc. The economic importance of the city is considerable. Besides being one of the principal centres of the beet-sugar industry in Germany, and well known for its fine fruit and vegetables, Magdeburg has great machine works. Among them are the famous Gruson Works at Buckau, now a part of the Krupp Works, and employing about 4000 persons. In addition there are extensive distilleries, chemical works, and manufactures of chicory, chocolate, tobacco, cigars, cement, artificial fertilizers, pottery, ribbons, gloves, and musical instruments.

The commerce is extensive, especially in beet sugar. Local manufactures, agricultural and colonial products, and books are also largely dealt in. Traffic is favored by frequent markets and an annual two weeks' fair in September. A considerable part of the commerce is carried on by water. At a cost of over $2,000,000, the city has latterly constructed a fine harbor, which accommodates the boats engaged in the Elbe transit trade, which amounts to some 4,000,000 tons of merchandise per annum. The municipal administration is in the hands of a chief burgomaster, a burgomaster, a council of 72 members, and a board of 25 magistrates. The municipality owns the water works and the gas works, both of which it operates at a profit. It also has a savings institution. The total figures as to population swelled very rapidly during the second half of the nineteenth century on account of the annexation of suburbs as well as of adjacent independent communities. From 84,401 in 1871 the figures rose to 202,234 in 1890, 229,663 in 1900, and 279,685 in 1910. The inhabitants are mostly Protestant.

History. Magdeburg first appears in history in the ninth century, and in 937 a monastery was erected there by Otho the Great. In 968 the city was made the seat of an archbishop, and was henceforth an outpost against the Slavs, becoming later an important commercial city and a member of the Hanseatic League. The municipal law securing administrative autonomy developed in Magdeburg in the Middle Ages, and known as the Magdeburg Right, was widely adopted in the granting of charters to cities in Germany and elsewhere. The city was very prominent during the course of the Reformation, which it adopted in 1524. It declined to make any compromise with Charles V, and hence was besieged in 1550 by Maurice of Saxony, whom in 1551 it was compelled to accept as overlord. It subsequently came under the control of Brandenburg, since the successors of its old archbishops, the so-called administrators, were chosen from the Hohenzollern. During the Thirty Years' War it suffered greatly; besieged unsuccessfully by Wallenstein in 1629, it was once more invested in 1631, this time by Tilly, the Imperial general. The citizens hoped for rescue from the Swedish King, Gustavus Adolphus, but he was delayed by negotiations with the Electors of Brandenburg and Saxony, who refused him passage through their territories. On May 20 (May 10, O.S.), 1631, the city was taken by surprise and destroyed almost completely. Thirty thousand of the inhabitants perished and not 200 houses remained standing. During the rest of the Thirty Years' War it changed hands repeatedly, until in 1638 Duke Augustus of Saxony became Administrator. By the Peace of Westphalia (1648) it was to become the possession of Brandenburg after the death of Duke Augustus. This occurred in 1680. From that time Magdeburg has shared the history of Brandenburg and Prussia. During the Napoleonic wars it fell into French hands (1806) and was given to the new Kingdom of Westphalia, but by the Peace of Paris (1814) was returned to Prussia. Consult, for its rôle in the Thirty Years' War, Klopp, *Tilly im dreissigjährigen Kriege* (2d ed., Paderborn, 1894–95); also Wolter, *Geschichte der Stadt Magdeburg* (3d ed., Magdeburg, 1901), and T. A. Dodge, *Gustavus Adolphus* (New York, 1906).

MAGDEBURG CENTURIES (Lat. *Centuriæ Magdeburgenses*). The name given to the first comprehensive Protestant work on the history of the Christian Church. The arrangement of this work was such that it devoted a volume to each century, whence the name "centuries," and the authors were called centuriators; it is called *Magdeburg* Centuries because begun in that city (in 1552). The chief of the centuriators was Matthias Flacius (q.v.), and his principal collaborators were Johann Wigand, Matthias Judex, Basilius Faber, Andreas Corvinus, and Thomas Holzhuter. The expenses of the work were borne by certain princes and noblemen. It was published at Basel (1559–74) in 13 volumes, bringing the history down to 1300. Six volumes of a new edition by Baumgarten and Semler appeared at Nuremberg (1757–65). Consult Schaumkell, *Beitrag zur Entstehungsgeschichte der magdeburger Zenturien* (Ludwigslust, 1898).

MAGDEBURG HEMISPHERES (so called from the place where they were invented). Two hollow hemispheres, of copper or brass, with their edges accurately fitting each other, one of which is furnished with a stopcock. When the edges are rubbed with grease, pressed tightly together, and the globe thus formed exhausted of air by means of an air pump, the hemispheres, which fell apart before exhaustion, are now pressed together with immense force; e.g., if they are one foot in diameter, they will, after exhaustion, be pressed together with a force of nearly a ton. This experiment was first performed by Otto von Guericke (q.v.) in 1654 at the Imperial Diet at Ratisbon.

MAGEE, m'gē̆′, WILLIAM CONNOR (1821–91). A prelate of the Church of England. He was born at Cork, Ireland; was educated at Trinity College, Dublin; and for a time was a curate in the latter city. Later he held two curacies in Bath, and became minister of Quebec Chapel, London, in 1859. The next year he returned to Ireland, where he became rector of Inniskillen, and dean of Cork in 1864, as well as dean of the Chapel Royal, Dublin, in 1866. He was appointed Bishop of Peterborough in 1868, and Archbishop of York in 1891, only a few weeks before he died. Dr. Magee was active in the organization of the Church Defense Society, which was intended to counteract the efforts of the Liberation Society to bring about the disestablishment and disendowment of the Church of England. He was president of the Church congress that met at Leicester in 1880, and from 1880 to 1882 was select preacher to the University of Oxford. He possessed great oratorical and controversial powers; contributed frequently to the *Fortnightly Review* and other periodicals; and published *The Gospel and the Age* (1884) and *The Atonement* (1887). A posthumous volume of addresses and speeches, and two sermons were published in 1891–92. Consult his *Life and Correspondence* by Macdonnell (London, 1896).

MAGELLAN, mȧ-jĕl′lan, FERDINAND. The discoverer of the Strait of Magellan. See MAGALHÃES, FERNÃO DE.

MAGELLAN, STRAIT OF. An irregular winding passage between the Atlantic and the Pacific oceans, separating the islands of Tierra del Fuego from the southern extremity of the South American continent, about lat. 53° south (Map: Chile, F 8). Its extreme length is 370 miles, and its breadth varies from 2½ to 70 miles. It has numerous bays and branches, especially at its southwest end, where it separates into channels inclosing a number of islands. The scenery along its shores is varied; at the east end the land is low and treeless, towards the middle it becomes mountainous and forested, in some places forming lofty precipices. Though the strait is generally free from shoals and other obstructions, its west portion is subject to impetuous currents and to rough and squally weather, rendering the passage unsafe for sailing vessels, which generally pass around Cape Horn. The strait is, however, very convenient for steamers. Its only considerable harbor is Punta Arenas (q.v.). The strait was discovered by Magellan in 1520.

MAGELLANIA, măj′ĕl-lā′nĭ-ȧ (Neo-Lat., from the proper name *Magellan*). A genus of Brachiopoda of the family Terebratulidæ. See TEREBRATULA.

MAGENDIE, mȧ′zhäɴ′dē̆′, FRANÇOIS (1783–1855). An eminent French physiologist and physician, born at Bordeaux. Through the influence of his father, who practiced as a physician in Paris, he became a pupil of Boyer, the celebrated anatomist. At the age of 20, after a competitive examination, he was appointed prosector in the faculty of medicine, and soon afterward a demonstrator. He was subsequently appointed physician to the Hôtel-Dieu. In 1819 he was elected a member of the Academy of Sciences, and in 1831 succeeded Récamier in the chair of anatomy in the Collège de France.

He was the first to prove experimentally that the veins are organs of absorption; he gave a more accurate account of the process of vomiting than had been previously given; he pointed out that an animal cannot live solely on any one kind of food; he investigated the physiological action and therapeutic uses of hydrocyanic acid and strychnine; he performed an important series of experiments on the cause of death when air is admitted into the larger veins; he made numerous experiments to determine the functions of various nerves and of different parts of the brain; and, lastly, he shares with Sir Charles Bell the honor of having discovered the separate functions of the two roots of the spinal nerves.

Magendie's chief physiological works are: *Précis élémentaire de physiologie* (Paris, 1816), which went through several editions and was enlarged into the *Eléments de physiologie,* which was translated into English and was for many years the best work on physiology in this language; *Leçons sur les phénomènes physiques de la vie* (ib., 1836–42); *Leçons sur le sang* (ib., 1839); *Leçons sur les fonctions et les maladies du système nerveux* (ib., 1839); *Recherches philosophiques et cliniques sur le liquide cephalo-rachidien ou cérébro-spinal* (ib., 1842). He was likewise the founder and for 10 years the editor of the *Journal de la Physiologie Expérimentale.*

MAGENTA, mȧ-jĕn′tȧ. A town in the Province of Milan, Italy, 16 miles west of Milan by rail (Map: Italy, B 2). It manufactures silk and matches. Its district yields excellent wine and an abundance of mulberries. It is chiefly famous as the scene of the victory by the French and Sardinians over the Austrians on June 4, 1859. The French and Italian troops were nominally commanded by Emperor Napoleon III and King Victor Emmanuel, but the victory was due to the tactics of General Macmahon (q.v.), who was created Duke of Magenta and marshal of France. Pop. (commune), 1901, 7974; 1911, 10,137.

MAGENTA. See COAL-TAR COLORS.

MAGERÖ, mä′gâ-rē. An island belonging to Norway, lying close to the coast of Finmarken, in the Arctic Ocean (Map: Norway, H 1). Its dimensions are 20 by 15 miles; it is very irregular in outline, deeply indented by fiords, and consists of a rocky plateau falling abruptly into the sea on all sides. It terminates on the north in North Cape (q.v.), the most northerly point of Europe, which rises almost perpendicularly from the sea to a height of 970 feet. Pop., 1910, 1732, mostly Norwegian and Lappish. A few shrubs and grass are found along the streams; lichens and reindeer moss abound, which support considerable herds of tame reindeer.

MAGGINI, mäd-jē′nē, or **MAGINI,** GIOVANNI PAOLO (1580–c.1630). An Italian violin maker, born in Brescia. He was a pupil of Gasparo da Salo, whose models he at first copied. Later he developed a model of his own, more accurate and elegant than those used by any previous makers, and also introduced a new way of cutting the wood used for the bellies of the instruments. It is supposed that he fell a victim to the plague which ravaged Brescia in 1628. Consult M. L. Huggins, *Giovanni Paolo Maggini* (London, 1892).

MAGGIORE, mȧ-jō′rȧ, LAKE. A body of fresh water, of which four-fifths is in the Italian provinces of Novara and Como, the northern fifth in the Swiss Canton of Ticino (Map: Italy, B 1). It is 636 feet above the sea, 37¼ miles long, 6 miles wide between Cerro and Feriolo, with an average width of a little over 2 miles and an area of 82 square miles. The greatest depth is 1221 feet. It is the longest lake in Italy, though surpassed in area by Lake Garda (q.v.). The river Ticino (q.v.) flows through the length of it from north to south, and the most important of the 20 other streams that feed it are the Maggia from the northwest and the Toce from the west. The north, west, and southwest shores rise into lofty mountains with snow-capped peaks, but the east bank gradually declines to the level of the plains of Lombardy on the southeast. The water in the north of the lake is green, in the south deep blue. The principal places on the lake are Locarno (q.v.), Magadino, and Brissago in Switzerland, and in Italy Cannobio, Maccagno, Luino (q.v.), Laveno, Intra, Pallanza, Baveno, Stresa, Arona (q.v.). As the St. Gotthard and St. Bernardino highways meet at Bellinzona, on the Ticino, 5 miles above the head of the lake, much of the Swiss and German trade with Italy formerly passed via the lake and the roads that parallel it. Steamboats every two or three hours in summer now connect the principal points on the lake (from Locarno to Arona in six hours), and the railroad between Bellinzona and Sesto-Calende, 36½ miles, skirting the east shore of the lake, is part of the system connecting Genoa (q.v.) with the north, via the St. Gotthard Tunnel. This road has turned some of the commerce from the port of Magadino. Along the west shore for 15½ miles runs the Simplon line from Pallanza, a famous winter resort, past Baveno, once the home of Queen Victoria, past Stresa, where the Italian nobility resort in summer, to Arona. Some manufacturing is maintained along the shore, especially at Cannobio, which markets wine, fruit, grain, cattle, hides, silk, and cotton goods. Laveno is at the mouth of the Boesio, on a bay that was once a fortified harbor for Austrian gunboats. The fortifications were pulled down in 1859, and a monument commemorates the Garibaldians who fell here in that year. A pottery now occupies the site of Fort San Michele; the other chief industry is silk spinning. Just behind Laveno rises the Sasso del Ferro (3485 feet), while a few miles to the northeast is Mount Nudo (4052 feet). Intra′ has important cotton, glass, and other factories, belonging mostly to Swiss proprietors. The famous Borromean Islands (q.v.) lie opposite Baveno.

MAG′GOT (probably from Welsh *maceiad*, *macai*, maggot, from *magu*, breed, Corn., Bret. *maga*, feed). The footless larva of any true fly. See Fly; Grub.

MAGI, mā′jī (Lat. *Magus*, Gk. Μάγος, *Magos*, from OPers. *maγu*, Av. *moγu*, magian, probably from Assyr. *maḥḥu*, magician, soothsayer). The name of the priestly order in ancient Media and Persia. Originally the designation Magi may have denoted members of a certain Median tribe, as we know from Herodotus (i, 101); but the religious association of the name seems to have existed from the earliest times. The name survives in the Magusæans, who settled in various places in Asia Minor. In Persian history the spiritual advisers of the Achæmenian kings are always called Magi, and their Median origin is generally acknowledged. Cyrus the Great was regularly attended by Magian priests; and, if we may believe Xenophon, it was Cyrus who first formally established them, although, as a priestly institution, the Magi must have been in existence before. A festival of the "slaying of the Magians" was long celebrated by the Persians in commemoration of the overthrow of the False Smerdis, a Magus, by Darius, and so of their not having been forced again to assume the Median yoke. The hatred of the sacerdotal caste evinced in this was probably more political and anti-Median than it was religious or anticlerical. The Median Magi were traditionally the priestly masters of the Persians; it was not lawful for a Persian to sacrifice without one of the Magi, and the power of this sacerdotal body must have been considerable in affairs of state as it was in religion.

There seems every reason to believe that Zoroaster was a Magian, if we may judge from references in Pahlavi literature, in the Greek and Roman writers, and in later Persian tradition. He was born in the very region of Media where the Magi abounded. (See Zoroaster.) In the *Avesta* (q.v.) the name Magus occurs certainly once in an allusion to a "hater of the Magi" (*Moγu-tbis*). The Parsis, or modern Zoroastrians, have kept up the tradition of the name, for the higher order of priests are called *Mobeds*, literally "Magian Masters." With regard to their doctrines it may be added that, so far as the Avesta may be presumed to represent the Magian code, and so far as we can judge from Herodotus, Plutarch, and other writers, the Magi recognized the principle of good and evil, light and darkness, as represented by Ormazd and Ahriman; they believed in a resurrection, a future life, and the advent of a savior; and in certain peculiar rites and customs, especially the preservation of the elements fire, earth, and water from defilement.

There seems little reason to question that the Magi exercised considerable influence even outside of Media and Persia, or that they were connected or associated with the priesthood of Babylonia and Chaldæa. Allusions in the Book of Daniel would imply this; and *Rab-mag*, in Jer. xxxiv. 3, may denote the "Chief of the Magi," although this interpretation is denied by some scholars. The Magian power was broken by the overthrow of the Persian Empire through Alexander's conquest and the consequent decadence of the Zoroastrian faith. Magism seems to have waned during the darker period of the Parthian sway, although it became paramount again under the Sassanian dynasty. To the condition of the priesthood during the darker period of the Parthians may be ascribed in some measure the evil sense associated with the word Magi by the Romans and by later Greek writers, although it was scornfully used as early as Sophocles—no doubt with an anti-Persian animus. The arts of divination, which the Magi must have practiced from the earliest times, seem to have brought the word into disrepute as wizard, necromancer, sorcerer, magician. Luke likewise uses it as a sorcerer (Acts xiii. 6). But the term is employed in its true sense by Matthew (ii. 1), of the wise men who came from the East to Jerusalem to worship Christ. The significance of this must be observed, because the Messianic doctrine was an old and established one in Zoroastrianism. Consult: Prášek, *Geschichte der Meder und Perser* (Gotha, 1906–09); F. V. M. Cumont, *Oriental Religions in Roman Paganism* (Chicago, 1911); id., *Les mystères de Mithra* (3d ed., Brussels, 1913); and especially J. H. Moulton, *Early Zoroastrianism* (London, 1913).

MAGI, Adoration of the. A popular subject with painters of the Renaissance and succeeding epochs. The scene is the well-known incident of the infancy of Christ in which the three wise men of the East, following the star of Bethlehem, worship and bear offerings to the infant Saviour. According to the mediæval tradition the Magis were kings, and they were constantly so represented in sacred art. They were usually attended by a great cavalcade of followers, clad in contemporary costume, which gave a fine opportunity to depict contemporary portraits and pageantry. Among the most celebrated versions by Italian painters are those by Gentile da Fabriano in the Florence Academy; Benozzo Gozzoli, in the Riccardi Palace, Florence, the most celebrated of all, and the best-preserved Renaissance fresco in the world; Filippo Lippi, in the Uffizi; Botticelli, in the Uffizi, with celebrated portraits of the Medici; Ghirlandaio, in the Uffizi and, best of all, in Santa Maria degli Innocenti; the remarkable version by Leonardo da Vinci in the Uffizi, unfinished but epoch-making in composition; Tintoretto in San Rocco, Venice, and elsewhere; and Veronese, who often depicted the subject (Brera, Milan, Dresden, National Gallery, London, Vienna Museum). Among northern painters it was portrayed by Quinten Matsys (Metropolitan Museum, New York), Albrecht Dürer (Uffizi, Florence), and often in the large canvases of Rubens, the finest examples being in the museums of Antwerp and Brussels.

MAGIC (Lat. *magice*, from Gk. *μαγική*, *magikē*, magic, sc. *τέχνη*, *technē*, art, from *μαγικός*, *magikos*, magic, from Μάγος, *Magos*, Magian, from OPers. *Maga*, Magian). The general term for the art or power of wonder working, with or without the assistance of supernatural agents.

Magic in Primitive Society. The facts of primitive magic are multiform and universal in their distribution. Many theories have been advanced to account for magical phenomena. Before reviewing some of these it will be well to give an account of the facts themselves. When the Ojibwa Indian desires to work evil on any one, he makes a small wooden image of his enemy and pierces its head or heart with a needle, in the belief that the object of his hate will be similarly affected; if the intent is to kill, the puppet is burnt with the accompaniment of magical words. In pursuit of a similar end the Malay takes bits of nails, hair, eyebrows, and other parts of the victim's body, and molds them into an effigy resembling the victim. For seven nights he scorches the figure slowly by holding it over a lamp while muttering incantations. Then the figure is burnt, and the enemy dies. To this day, in India, a magician will make an image of earth, taken from 64 filthy places, and will mix it with bits of hair, nails, etc. Then he writes the name of his enemy on the chest of the figure and maims it in some way in the assurance that the fate of the original will be that of its copy. Passing from evil to beneficent or harmless effects, we find that a barren woman in Sumatra, if she wants to become a mother, will make a wooden image of a child and hold it in her lap, believing that this objectification of her wish will lead to its fulfillment. The ancient Hindu mode of winning the love of a woman was to shoot an arrow into the heart of a clay image of the woman, the bowstring used for that purpose being of hemp, the arrow shaft of black *ala* wood, the feather an owl's plume, and the barb a thorn. In other numerous instances an entire group of people will perform the magical act. Thus, the magical ceremonies of the totemic groups of central Australia consist in elaborate dramatizations of the actions, cries, etc., of the totemic animal, and the supposed result of the ceremony is the multiplication of the animal. According to a widespread belief the behavior of wives in the absence of their husbands will affect the success of the latter in war or at the chase. Thus, among the Eskimo, when the men are away whaling, the women are supposed to spend their time in comparative idleness; if any garments are to be repaired, the women take them as far away from the sea as possible and do the work in small huts just large enough for one person; no work is done which is connected with any kind of noise, and in the huts of the men who are away no work whatever should be done. Among the Tshi-speaking peoples of West Africa, on the other hand, or among the Thompson Indians of British Columbia, or among the Californian Yuki, when the husbands are away on a war expedition, the wives will perform elaborate dances, in which the incidents of combat are dramatized, believing that such performances will insure the success of their distant mates. The belief is entertained by many peoples that barren or fruitful women may have an influence, for the better or worse, on vegetation. Thus, the African Baganda believe that a sterile woman prevents her husband's garden from bearing fruit; hence such women are often divorced. Among the Zulus, on the other hand, a pregnant woman is sometimes made to grind corn, which is then burnt among the half-grown crops to make them grow.

Similar ideas underlie practices connected with charms and amulets among many peoples and in many lands. Thus, among the Eskimo, men desirous of becoming great slayers of whales wear the foot of the guillemot, which is clever at catching cod. To give their boy the strength of a bear parents sew into the cap the skin from the roof of a bear's mouth. To acquire the fox's cunning a piece of the fox's head or of old dried fox dung is sewed into one's clothing. Among the Yuchi an amulet symbolizing a turtle will be worn by a child to induce sleep. The Indians of the plains represent on their shields spiders, lizards, and turtles, because they are hard to kill. The Arapaho warrior wears an amulet consisting of a bracelet of badger skin, with a gopher skin, an owl claw, some bells, feathers, seeds, and skin fringes. The badger skin stands for the horse's speed, the claw for the seizing of the enemy, the motion of the feathers drives away the enemy, and the bells warn the warrior of the impending fight. The Iroquois myths tell of a magic skin which is represented as covered by the hairs of all kinds of animals; when a hunter wants a plentiful supply of a certain animal, all he needs to do is to touch the appropriate hair while mentioning the number of animals desired, and the success of the chase is insured.

By such and similar devices crops are made to grow, women to bear children, enemies are maimed or killed, war parties made successful, the sun is saved from the clutches of an eclipse conceived as a monster, the rain is induced to fall in abundance, totems are multiplied, the qualities of animals are acquired by humans, the sick are cured, innumerable desires are satisfied, innumerable ends are attained or supposed to be attained. This is magic. But how explain the beliefs and practices underlying magical phenomena? To answer this question, various theories have been advanced by different authors, some of which must now be passed in review.

Theories of Magic. Interpretations of magic have been attempted by Tylor, Lang, Frazer, Marillier, Hubert and Mauss, Lehman, Marett, and Leuba. As space does not permit us to consider the views of all of these authors, we shall briefly discuss the theories of Frazer, Hubert and Mauss, Marett, and Leuba. Frazer distinguishes homœopathic, or imitative, and contagious magic. The first is based on similarity, the second on contact. The killing of an enemy by destroying his effigy is an act of imitative magic; the curing of a wound by anointing the weapon which caused the wound is contagious magic. Frazer distinguishes magic from religion. Religion, according to him, involves the belief in a superior deity exercising a moral influence on mankind. There is no such ethical element in magic, nor is there any belief in a god or spirit involved in magical procedure. Magic must rather be conceived as primitive science, which is based on the recognition of natural law, of an orderly succession of events. True, its postulates are erroneous, but centuries elapse before mankind becomes aware of fallacies underlying magic. When that moment arrives, the reign of magic wavers; religion, based on a belief in an all-powerful deity, takes its place; on the other hand, the theoretical postulates of magic prepare the way for the conceptions of modern science.

According to Hubert and Mauss the fundamental distinction between magic and religion lies in the fact that the latter is an organized cult; it is prescribed, official, while the former is secret or even prohibited; it may be permitted, but is never prescribed. True, the mechanism of magic involves three laws—that of similarity, contiguity, or contrast between the object forming part of the magical act and the object to be affected. But this does not suffice as an interpretation of magic; it is, above all, dynamic; it involves an active principle, a belief in power, *mana*, which pervades the universe, and the belief in which is traditional; it is not based on experience, nor is adverse experience able to upset it.

Marett believes that magic and religion were originally one, that the fundamental primitive fact is the belief in the supernatural, and that magic and religion did not become differentiated until a later period in the development of mentality. While magic is thus the positive handlings of the supernatural, it carries within itself the root of taboo (q.v.), the prohibited object or act, negative magic.

Leuba's treatment of magic is somewhat more analytical. As the fundamental postulates of magic, he distinguishes three principles: the principle of repetition, that which happened once will happen again; the principle of the transmission of an effect from one object to another, the relation involved being that of likeness, contact, or cause and effect; and the principle of the efficiency of will effort, which again appears in three forms—(*a*) cases where no belief in force is involved, as exemplified by superstitions connected with Friday, the number 13, the horseshoe, gambling luck; (*b*) cases in which the presence of *mana*, impersonal power, is the cardinal fact; (*c*) will magic proper, such as appears in spell, incantation, curse. As to the origin of magical beliefs, it is, according to Leuba, distinct from that of religion. Magical processes took their beginning in unteleological, spontaneous activities; these activities became magical only through accidental discoveries of their originally unpremeditated effects; then followed a more conscious elaboration of magical beliefs.

Among these theories of magic, and many others, Frazer's conception of magic as a primitive science must be singled out as most strikingly fallacious. Frazer's idea is based on what William James once called the "psychologist's fallacy." True, the processes of magic seem, from the standpoint of the outsider, to constitute a series of uniform successions of actions and effects, or believed effects. But is not the perspective of the participator in these magical processes a thoroughly different one? He surely does not believe in uniformities in nature, for, if such were his belief, the majority of magical practices would become unnecessary. He does, indeed, have an unbounded faith in the efficacy of the magical act or ceremony; but here, again, there is no concept of law, of uniformity, involved; it is the belief in power which is fundamental. Exercise the power, and the effect follows.

Nor is Frazer more fortunate in the distinction he draws between magic and religion. His definition of religion (q.v.) is obviously gratuitous. Of course, he is at liberty to use any definition of religion which to him seems appropriate, provided he remains consistent with his definition; on the other hand, by placing religion so high up in the scale of mental evolution, he is forced to make artificial distinctions which do not correspond to psychological reality. Had he permitted his definition of religion to be more elastic, he could not have escaped seeing that beliefs and ceremonies characterized by him as purely magical, such as the Australian *intichiuma*, involve emotional states which unmistakably belong to the category "religious." Nor can we side with him when he attempts to exclude the spirit from any participation in magical procedure, for acts which allow of but one psychological interpretation and must be regarded as magical are among one people purely mechanical devices, while among another spirits appear as the carriers or transmitters of magical power. Thus, the Australian medicine man seems to practice his craft successfully without the assistance of spiritual agencies, whereas the shaman of northwestern America or northeastern Siberia achieves the same results, but almost invariably in coöperation with a spirit assistant, a guardian spirit. Thus, we must take sides with the other authors here reviewed and against Frazer, in their contention that magic is not necessarily to be conceived as prior to or more primitive than religion.

Could the process of history be revealed, both magic and religion would doubtless be found rooted in beliefs held by man in most primitive times; nor does it seem justifiable to hold with Leuba that the origins of magic and religion were necessarily distinct. While in later periods the contrast between magical and religious procedure increases until, with the institutional side of religion, the differentiation between the two sets of phenomena becomes unmistakable and radical, the emotional nucleus from which both magic and religion proceed seems to be the same. The two fundamental concepts underlying both magic and religion are those of spirit and of power. Either one or the other, or both are always present in a magical or religious situation, in so far, at least, as it may be conceived as dynamic, i.e., as containing an active emotional thrill. For both magical practice and religious ceremony with their underlying beliefs tend to become conventionalized and deëmotionalized. The religion becomes a ritual and a dogma, mere formal shells of the dynamic experiences which had once given life and color to the magical or religious complex. While in that early condition magical and religious practices and beliefs largely overlap and fuse, the further progress of the two phenomena proceed along slowly divergent paths. Magic becomes more and more teleological and finally develops into a pure art or technique, while religion proceeds along the line of subjective elaboration which, beginning at a stage somewhat above the primitive, always reaches its goal in the elaborate emotional and conceptual world of the mature religious consciousness such as is revealed by the lives of the saints, prophets, and religious reformers.

Of the two ingredients of magic and religion, the conception of spirit is well known and understood; the conception of power, of magical potence, on the other hand, being a relatively recent product of ethnological analysis, requires some further words of explanation.

Conception of Impersonal Magical Power. The existence of a belief in primitive society other than that in spirit was first brought to our attention in connection with the Melanesian term *mana*. It does not mean spirit, but power, potency, life, mind—all concepts involving the idea of dynamic power, efficiency. Mana is not everywhere in nature, but it manifests itself through objects, beings, including man, spirits, gods. Wherever there is evidence of power, it is mana that is responsible for it, and the stranger, the more unusual, the power, the greater the charge of mana.

The evidence from Melanesia found support in America. J. N. B. Hewitt, an ethnologist of Indian extraction, interprets Iroquois religion as based on a fundamental concept, *orenda*, the meaning of which, as ascertained from the testimony of the Indians and by linguistic analysis, is very nearly that of the Melanesian mana. The late William Johns, another student of Indian blood, discusses a very similar concept among the Algonquin Indians, where it is known as *manitou.* It means power, mystery, and is impersonal, although it may ally itself with a being and thus become personal. The concept occurs most frequently in connection with the acquisition of the so-called guardian spirits, a custom not restricted to the Algonquin but found almost everywhere among Indian tribes. At the dawn of maturity the Indian youth withdraws to a shanty, built on an isolated spot in a forest. There he fasts, his scanty food being brought to him by some old man or woman, purifies himself until he is so clean "that the spirits can look through him." He dreams and finally sees a vision in which a spirit animal or being appears to him, a *manitou,* charged with magical power. The spirit confers various powers on the youth, such as the power of curing disease, or escaping the arrows of the enemy, or following game successfully. These powers are henceforth in the control of the youth, while the spirit remains his protector.

The discovery of this primitive concept of impersonal power filled a long-felt gap in the theories of savage religion. It was taken up with enthusiasm by the speculative wing of ethnologists. Marett proceeded to delight the anthropological world with his conception of *animatism,* a belief in impersonal power preceding animism; Pechuel Loesche applied the same concept in a novel interpretation of West African fetishism; Durkheim, finally, identified the concept of mana with the totemic principle, a still more primitive idea which he posited at the root of Australian totemism. And just as animism was so often conceived as a spiritual philosophy of nature, so the mana belief was conceived by some as a spiritless philosophy of nature, as a dynamism (Levy Bruhl, Leuba).

A dispassionate examination of these theories does not fail to reveal the tendency to make the mana belief a universal interpretative principle, a magic key to all the mysteries of primitive religion. Needless to say, no sufficient grounds can be adduced for regarding mana as a substitute for spirit, or as necessarily preceding spirit, nor as a primitive philosophy of nature. Moreover, the various beliefs which were so precipitately and so uncritically identified with mana may prove, on further examination, to differ in some aspects from mana or be altogether unlike it. However that may be, no doubt can be entertained as to the existence in the primitive mind of a concept of impersonal power, a magical substance which does things. Speculation as to the origin of such ultimate concepts is always difficult and dangerous. Thus, while our interpretative attempts must be taken for what they are worth, it may be noted that the coexistence of the mana belief with a belief in spirit possesses a high degree of psychological plausibility. Whatever the origin of the conception of a spirit, it must certainly have been developed under the stress of religious situations, the psychological rationale of which is a certain kind of emotional thrill. Now, while this emotional pressure served to further the conceptual elaboration of the idea of spirit, it seems also to have been directly objectified by the mind. In part this objectified thrill became absorbed by the spirit concept, for to exert power is of the essence of spirit; in part, however, it remained a free psychic element, impersonal, volatile, infectious, highly dynamic—a loosely objectified emotion, *that which causes the thrill.* Further we need not go. Within these limits the mana concept seems capable of doing capital service as one of the cardinal interpretative principles of primitive religion and magic.

Magic in Ancient and Mediæval Times. The magical lore and practice of the Chaldæans was extensive. About 200 tables containing the descriptions of Chaldæan magical processes, incantations, etc., are now preserved in the British Museum. They are copies of originals prepared by order of King Asurbanipal (884–860 B.C.), which were written in two languages, Assyrian and Accadian. From these tables we learn about the complicated demonology of the Chaldæans as well as the extensive use made by them of magical charms and amulets. Another important source is Sargon's work on divination, which contains 14 chapters devoted to prognostication by the flight of birds and the intestines of sacrificial animals, interpretation of various natural phenomena and of dreams, and to other topics. Sargon II (772–705 B.C.) had the work copied and systematized.

The Greeks added but little to magic that was original. They developed to a high degree the conception of the magic power of the spoken or written word. Medical activity among the Greeks was, up to the time of Hippocrates, in the hands of priests attached to the temple of Apollo and Æsculapius, who practiced divination (see NECROMANCY) and cured diseases by means of magical processes.

In Rome divination was practiced on an extensive scale. Divination by the cries and flight of birds was the favorite method. The cries of the crow, the raven, the night owl, and the rooster; the flight of the eagle and the hawk—figured in these magical rites.

The most complete data on Roman magic were probably contained in the famous books of Sibylla. According to tradition their number was originally nine, of which six were destroyed, while three were bought by Tarquinius Superbus. They were kept in the temple of Jupiter in the capitol, and a college of 15 men was permanently attached to them, who interpreted the meaning of their contents. The books were destroyed by a fire about 400 B.C.

After the advent of Christianity the belief in demons and magical powers did not disappear, but there arose a gulf between the power that was exercised by means of saints, angels, etc. (white magic), and that exercised by means of demons (black magic). Throughout the early Christian times the laity as well as the clergy believed in the influence of relics, of holy water; incurable diseases disappeared in the presence of the grave of Christ; etc. Beliefs of this sort lived on long after the period of their greatest diffusion, nor can modern civilization boast of complete emancipation from them. Witness the cures of Lourdes, the trade in relics in Palestine, the healing saints of Russia. The beliefs of early Christian times reacted viciously on the medical practices of the period, with the result that innumerable fantastic methods of curing disease were used and believed in, which almost completely replaced the much more scientific procedure instituted by Hippocrates.

Among the Scandinavian peoples we again find the supreme belief in the influence of word or thing. They distinguished four categories of magic devices—magic signs, magic sayings, magic drinks, and a most dreaded magical procedure called "Seid," which consisted of magic songs combined with some esoteric elements. No distinction existed among these peoples between black and white magic. The magic could be good or bad according to the results attained.

One of the widely diffused magical rites of the early Middle Ages was the ordeal (q.v.), which was a method of establishing guilt or innocence by means of a magical procedure. During that period the common people and the petty clergy preserved their belief in magic and demons, but the Church ruled otherwise; magic was no longer recognized by it, and witchcraft was regarded as impossible. Hence responsibility for an accusation in witchcraft fell upon the accuser. In 785 the Synod at Paderborn decreed that one who, misled by the devil, believes, with the pagans, that a woman can be a witch and burns her must be put to death.

In the course of the eleventh and twelfth centuries numerous individuals arose who refused to accept the teachings of the orthodox Church and preached various modifications of the accepted dogma. These were known as heretics. The current interpretation of heresy was that those who entertained it stood in communication with the devil, who induced them to forget the teachings of the Holy Church and poisoned their minds with discrepant opinion. They were persecuted and often put to death. In all such cases the accusation of witchcraft could not be officially proclaimed by the Church, which continued to deny the very existence of witchcraft. The change of attitude in these matters was marked by the writings of Thomas Aquinas (c.1226–74), who with great argumentative will attempted to demonstrate the reality of witchcraft. The first legal persecution of a witch took place in 1264, and from that time until some time in the eighteenth century untold thousands of innocent women were tortured and put to death in the name of the Church. The powers of witches, according to the belief of the time, were many and varied: they could induce hair, brushes, glass, needles, knives, nails, fishbones, worms, and scorpions, to enter the body of a person; by placing certain herbs on a knotted strap under the bed they could prevent childbirth, and then the number of knots would tell how many children were thus prevented from being born; they had the power of traversing space with incredible rapidity; and so on. The belief in witchcraft brought in its wake the utilization of various magical methods by means of which a witch could be recognized and her activity counteracted or forestalled.

Another stage in magical thinking is marked by the work of Agrippa (born at Cologne in 1456). In his book *De Occulta Philosophia* he propounded a theory of magic the substance of which consisted in an attempt to reduce magic to natural law. He taught that in the world of material and spiritual things the higher always influences the lower, and that the lower reacts; also that all things that belong to the same level influence each other. Thus, all magic was embraced in a universal natural law. Magic no longer depended on prohibited operations performed with the assistance of spirits, but in a teleological application of the natural forces such as were known to the physics, mathematics, and theology of the time.

Of the pseudoscientific offshoots of magic, two deserve a word of comment, astrology and alchemy. Astrology (q.v.) was the science of reading the stars and their movements, by means of which could be foretold earthquakes and political changes, the weather, the fate of infants, the outcome of diplomatic strife or war, the place where objects were hidden, etc. Alchemy (q.v.) was the art of transforming the metals into silver and gold. Many an alchemist of the time claimed to have found the goal of his strivings; but, whereas all such discoveries were doomed sooner or later to prove illusory, the persistent and systematic occupation with chemical compounds brought with it a gradual amassing of chemical knowledge and many a fruitful lesson in scientific experiment.

Modern Survivals of Magic. While the emotional thrill which once accompanied magical art is foreign to modern culture; while magic is no longer practiced either individually or publicly; while the phenomena once interpreted through magical concepts are no longer so interpreted, but have passed over to the domains of common sense or of science—modern culture has by no means freed itself from the survivals of magic, of beliefs in influences exerted through channels other than those given by the world of physical and psychic phenomena. Many people delude themselves with the belief of living in a thoroughly rationalized era until some one in the room opens an umbrella. The power of the evil eye has not lost all its terrors. People still "knock wood" to avert the consequences of excessive optimism. We have our lucky and unlucky days; the discovery that 13 guests have been invited to the dinner party prompts the hostess to make a hasty revision of her arrangements; an inconspicuous horseshoe continues to insure the well-being of many a household; many a college girl consults the color of the precious stone on her finger before committing herself to an important step; charms and amulets are carried by more men, women, and children among us than is generally believed, although some of those who carry them would be loath to admit the fact. Superstitions of this sort reap their richest harvests in circles of men and women whose success depends on a multitude of unforeseeable causes. The hunter, the fisher, are proverbially superstitious. Criminals, as a class, are superstitious. The gambler who ever finds himself at the mercy of a mysterious power knows a hundred signs and tricks by means of which to foretell, nay, even to control, the mood or intention of that power. The actor whose career is fed on handclapping is thoroughly versed in the lore of things and acts that are lucky and unlucky. The business man, to the extent to which business is a gamble, is, like the gambler, superstitious. While most of us do no longer see visions, we still dream dreams, and some of us thus know the future. How many there are who will scoff at the idea that a nun or a black cat may bring misfortune, but will take a side street to avoid a funeral procession. We laugh at the omens of classical antiquity, yet a trifling mishap at a marriage ceremony, or a birthday celebration or a presidential inaugural arouses adverse emotion to a degree quite disproportionate with the actual inconvenience or delay caused by the incident. One of the most deeply rooted and widespread survivals of magic belief is the faith in the influences exerted on the unborn child by certain experiences of the mother. It is probably an understatement to say that in our own society every second mother could tell of situations which she had sought in order favorably to influence the child she carried in her womb, through the channel of her own visual or auditory impressions, and of other situations which she had shunned in order to ward off from the child evil influences derived from similar sources. Thus does the past live in the present. See Legerdemain; Witchcraft.

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MAGIC CIRCLE. See Circle, Magic.

MAGIC FLUTE. See Zauberflöte.

MAGICIAN OF THE NORTH. A name applied to Sir Walter Scott. It was also used by Johann Georg Hamann of himself.

MAGIC LANTERN. An optical instrument, by means of which magnified images of small transparent pictures can be thrown upon a white surface in a darkened room. It is a form of projection apparatus, and the name is usually given to the smaller instruments or toys, while stereopticon or projection lantern is applied to the larger and more practical instruments used for lectures and other demonstrations. See Projection Apparatus.

MAGIC MIRROR OF JAPAN. A few of the small, round mirrors used by the Japanese have the property of reflecting light to a screen or other surface so as to form images corresponding to the ornamental designs on their backs. As these mirrors do not differ in appearance from those that do not furnish such images, they have been termed magic mirrors, and their peculiar property furnished an interesting problem to scientists for a number of years. The Japanese hand mirrors in general are made of bronze, more or less convex on their reflecting side, with a polished surface of mercurial amalgam, and have on their back ornamented figures, such as flowers, dragons, and similar patterns. Professors Ayrton and Perry ascertained that there were certain portions of the reflecting surfaces corresponding to the designs on the back, which were more worn away in the course of polishing and thus became concave, or at least less convex than the rest of the surface. This circumstance, which results from a mere accident in the process of manufacture, served to explain the formation of the bright images on a dark ground when the mirror was used to reflect light to a surface. The magic mirrors, which are extremely valuable, have been produced in England by following this principle. Consult *Proceedings of the Royal Society of London*, vol. xxviii (London, 1879), and S. P. Thompson, *Light Visible and Invisible* (New York, 1910).

MÁGICO PRODIGIOSO, mȧ′ʜĭ-kȯ prȯ′dĭ-ʜĭ-ō′sȯ, El. One of the most striking plays of Calderón.

MAGIC SQUARE. A term applied to square arrays of numbers possessing the property that the sums of the various columns and rows, and of the two diagonals, are equal. In Fig. 1 this sum is 34. This square (the earliest known in Europe) was represented in Dürer's copperplate entitled *Melancholia.* The origin of magic squares is generally ascribed to China, and there is evidence in the *Yih King*, one of the earliest of the Chinese classics, that these squares were known there at a very early period. A magic square is found on one of the gates of the fortifications, in the Sanskrit characters, in the East Indian city of Gwaloir, but its antiquity is not such as to justify the assumption of Hindu origin. Magic squares were, however, certainly known to the Arab astrologers, who claimed for them a peculiar supernatural power and recommended them as talismans and amulets. A similar power is attributed to them to-day among the Hindus and to some extent in Europe. The natives of Tibet commonly wear them as amulets, and the Chinese make much use of them.

1	14	15	4
12	7	6	9
8	11	10	5
13	2	3	16

Fig. 1.

The magic square was a subject of much study by the Japanese mathematicians of the seventeenth century, and much ingenuity was shown in their treatment. Magic circles and magic wheels were also studied by them.

There are various methods for constructing magic squares of an odd number of cells. One of the oldest European methods of which we have any knowledge is described by De la Loubère in his work *Du royaume de Siam* (1691) and by him ascribed to the Hindus of Surat. The rule is as follows: Write 1 in the middle cell of the top row, 2 in the first cell to the right of the middle of the bottom row, then following the diagonal to the right until the right hand margin is reached; then go to the row above and take the left-hand cell, and again follow the diagonal upward to the right, and when the upper margin is reached, go to the lowest row and one cell to the right.

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

Fig. 2.

If progress is barred by a filled cell, go one cell down from the last number written and proceed as before. (See Fig. 2.) Another well-known method for an odd number of cells, due to Bachet de Méziriac (see BACHET), is as follows: Take, e.g., 25 cells. Arrange and number them as in Fig. 3. Then slide the outside cells to the sides opposite those on which they rest, thus filling all cells, as in Fig. 4.

				5				
			4		10			
		3		9		15		
	2		8		14		20	
1		7		13		19		25
	6		12		18		24	
		11		17		23		
			16		22			
				21				

FIG. 3.

It is not so simple to construct magic squares with even numbers of cells. The following method is, however, not particularly difficult.

3	16	9	22	15
20	8	21	14	2
7	25	13	1	19
24	12	5	18	6
11	4	17	10	23

FIG. 4.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

FIG. 5.

Suppose the cells are filled, in the first place, with the numbers arranged in the natural order, as in Fig. 5.

It will be observed that the diagonals are already magic, since each equals the constant sum $\frac{n}{2}(n^2+1)$. It therefore only becomes necessary to arrange the rows and the columns to meet the definition. In the rows the sum of the numbers in the kth from the top is $\frac{n}{2}(n^2+1)-\frac{n^2}{2}(n-2k+1)$, and the sum in the kth from the bottom is $\frac{n}{2}(n^2+1)+\frac{n^2}{2}(n-2k+1)$. Furthermore, the number in each cell of the kth row from the top is less than the number in the corresponding cell in the kth from the bottom by $n(n-2k+1)$. Hence, if in these two rows we make $\frac{n}{2}$ interchanges of the numbers in corresponding cells, we increase the numbers in the kth row from the top, and decrease those in the kth from the bottom, by $\frac{n}{2}n(n-2k+1)$, and therefore make each of these rows magic. But in doing this it is, of course, necessary to leave the sum of the diagonals unchanged. It next becomes necessary to consider the columns. The procedure here is much the same as in the case of the rows. The sum of the numbers in the kth column from the left was originally equal to

$$\frac{n}{2}(n^2+1)-\frac{n}{2}(n-2k+1),$$

while in the kth column from the right it was

$$\frac{n}{2}(n^2+1)+\frac{n}{2}(n-2k+1).$$

The number in each cell of the kth column from the left was originally less than the corresponding number of the kth column from the right by $n-2k+1$. Hence $\frac{n}{2}$ interchanges are necessary as before, care being taken as to the diagonals. The difficulty comes in making the double interchange without disturbing the sums of the diagonals, but it can be shown that this interchange is always possible if $n > 2$. Starting with the initial square, the changes for a 4^2 square are shown as follows:

1	14	15	4
9	6	7	12
5	10	11	8
13	2	3	16

FIG. 6.

1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

FIG. 7.

Interesting methods for constructing magic squares of an odd or an even number of cells are found in the works of Hoshino Sanenobu (1673), Isomura (1660), Seki Kowa (c.1665), Kurushima (c.1750), and other Japanese writers.

Besides magic squares, circles, magic wheels, magic polygons, and solids of various forms have been studied.

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MAGIE, mȧ-gē′, WILLIAM FRANCIS (1858–). An American physicist, born at Elizabeth, N. J. He graduated in 1879 at Princeton University, to which, after study at the University of Berlin (Ph.D., 1885), he returned as professor of physics. In 1912 he became dean of the faculty. In 1909–10 Magie was president of the American Physical Society. His papers on the contact angle of liquids and solids and on the specific heats of solutions are noteworthy. His principal books are: a revision of Anthony and Brackett's *Physics* (1896); a translation of Christiansen's *Theoretical Physics* (1896); a translation of *The Second Law of Thermodynamics*, from memoirs by Carnot, Clausius, and Thomson (1899); *A Course of Lectures on Physics* (1904); *Principles of Physics* (1911).

MAGINI. See MAGGINI.

MAGINN, mȧ-gĭn′, WILLIAM (1793–1842). An Irish author, born in Cork. He graduated at Trinity College, Dublin, in 1811. From 1813 to 1823 he conducted a school at Cork and, beginning in 1819 with the doggerel-Latin version of *Chevy Chase*, for nine years contributed to *Blackwood's Magazine* a series of clever articles. In 1823 he went to London, where he was employed by Murray as European correspondent of the daily *Representative*. On his return to England he was for a time joint editor of the *Standard* and in 1830 assisted in establishing *Fraser's Magazine*. In this periodical first appeared his inimitable *Gallery of Literary Characters*, with excellent accompanying sketches by Maclise. In 1836 his attack on a novel by Grantley Berkeley occasioned an innocuous duel. The three essays on *The Learning of Shakespeare* (1837) and the *Homeric Ballads* (1838), versifications of portions of the *Odyssey*, display something of his real scholarship. His miscellanies exhibit the Anglo-Irish fancy in the full career of its wildest drolleries, and no "rattling Hibernian tale" outrattles the dare-devil exuberance of "Bob Burke's Duel with Ensign Brady" or that equally good "A Story without a Tail," reeking with convivial high spirits. Brought by intemperance and debt to the Fleet, where he dwelt even as Thackeray's "Captain Shandon"—he was the original of that character—he emerged thence, through the good offices of Sir Robert Peel, to die in extreme poverty. A collection of his writings was published in 1855–57 (New York, 5 vols., ed. by R. S. Mackenzie) and another in 1885 (London, 2 vols., ed. by R. W. Montagu). Consult H. S. Krans, *Irish Life in Irish Fiction* (New York, 1903).

MAGINNIS, CHARLES DONAGH (1867–). An American architect, especially of churches. He was born at Londonderry, Ireland, studied in London, and after 1886 practiced in Boston, Mass. (Maginnis and Walsh). He became a member of municipal and State art commissions and published *Pen Drawing* (1898).

MAGISTER, THOMAS. See THOMAS MAGISTER.

MAGIS′TER SA′CRI PALATII, pȧ-lā′shē-ī or pȧ-lä′tē-ē (Lat., master of the sacred palace). An officer of the papal court. It is said that St. Dominic while in Rome noticed that the servants of the cardinals were compelled to pass much time in idleness hanging around the doors of the Vatican while their masters were in audience. So he received permission to read the Scriptures to these people. When he went away another was appointed to succeed him in this labor. Out of this practice arose the present office, which is a very important one, as the incumbent is the censor of all books and pamphlets published by Catholics in Rome, a member of the congregations of the Index, the Inquisition and Rites, and is one of the important councilors of the Pope on theological matters. He is always a member of the Dominican Order.

MAGISTRAL DRUGS. See OFFICINAL PLANTS.

MAG′ISTRATE (OF., Fr. *magistrat*, from Lat. *magistratus*, magistrate, *magister*, master; connected with *magnus*, Gk. *μέγας*, *megas*, Skt. *mahant*, AS. *micel*, OHG. *mihhil*, great). In its broadest sense, a person clothed with power as a public officer. Blackstone employs it in this sense. Stating that the supreme magistracy was divided between King and Parliament, and discussing the powers of each, he proceeds to describe the subordinate magistrates of the most general use and authority, which, he tells us, "are principally sheriffs, coroners, justices of the peace, constables, surveyors of highways, and overseers of the poor." In this generic sense the term is used in the Declaration of Rights of Virginia, Massachusetts, and other States. One of these runs as follows: "That all power is vested in and consequently derived from the people; that magistrates are their trustees and servants, and at all times amenable to them." The writers of the *Federalist* gave this broad signification to the word when they designated the proposed President of the United States as the chief magistrate of the Union and compared his powers and duties with those of the governors or chief magistrates of the various Commonwealths.

At present the term is rarely employed in legal parlance in its generic sense, except in connection with the office of President or of Governor. In England it appears to be confined to ordinary justices of the peace (q.v.), who are appointed by the crown through the Lord Chancellor and serve without pay, and to the stipendiary or police magistrates, who are appointed by the crown on the nomination of the Home Secretary and receive salaries fixed by local boards, subject to the approval of one of the principal secretaries of state. The courts held by these officers, although technically described as petty sessions, special sessions, and quarter sessions, are popularly known as magistrates' courts. Stipendiary magistrates must be barristers of at least seven years' standing.

In the United States the meaning of magistrate, as a statutory term, has been frequently considered by the courts. While these decisions are not altogether harmonious, the prevailing view is that the term is to be understood in the narrow sense, now attaching to it in England, of "an inferior judicial officer, such as a justice of the peace." Police courts in cities are frequently known as magistrates' courts. Consult: Shirley, *An Elementary Treatise on Magisterial Law* (London, 1896); P. C. Dugan, *Law and Practice for Justices of the Peace and Police Justices* (5th ed., Albany, 1906); John Binns, *Binns's Justice, or Magistrates' Daily Companion* (Philadelphia, 1912); Edwin Baylies (ed.), *Bender's Justices' Manual of Civil and Criminal Law and Practice for Justices of the Peace and Police Justices in New York* (3d ed., New York, 1913).

MAGLIABECCHI, mä′lyȧ-bĕk′ē, ANTONIO DA MARCO (1633–1714). An Italian scholar and bibliographer, born at Florence. For 40 years he was a goldsmith. From his earliest years, however, he displayed an inordinate passion for the acquisition of book knowledge and, having mastered the Greek, Latin, and Hebrew languages, literally buried himself among books, disorderly piles of which encumbered every portion of his dwelling. In his daily habits he grew to disregard the requirements of social and sanitary life; and such was his avidity of study that he finally denied himself even the requisite intervals of repose. His memory was prodigious. Regarded as the literary prodigy of his times, he was appointed court librarian by Cosimo III, Grand Duke of Tuscany, and many tributes of respect were tendered him by royal and distinguished personages. He was intolerant of literary merit in others, was involved in several bitter literary squabbles, and died leaving, outside of his correspondence (ed. by Targioni, Florence, 1745), no written record of his encyclopædic knowledge. His library of 30,000 volumes he bequeathed to the Grand Duke, who gave it to the city of Florence, where it now forms part of the National Library. Consult Salvini, *Orazione funerale in lode di Antonio Magliabechi* (Florence, 1715). See FLORENCE, *Educational Institutions;* LIBRARIES.

MAGMA, măg′mȧ. In geology, the name applied to the bodies of molten mineral matter which by cooling produce the different kinds of igneous rocks. Such cooling takes place when the magma forces its way towards the surface, either by melting and breaking down the overlying structure or by egress through some fissure or vent, and comes into a region of lower temperature and pressure. In many cases the magmas apparently never reach the surface, but solidify at considerable depths under conditions which favor slow cooling and complete crystallization of the mineral materials. Rocks formed in this way are known as plutonic or deep-seated rocks and appear at the surface only long after their consolidation, when the original cover has been eroded away. Examples of the plutonic class are granite, syenite, and other coarse-grained types. If the magma pours out at the surface through an opening, it cools rapidly and forms a finely crystalline or even glassy rock, like rhyolite, basalt, and obsidian, which belong to the effusive or volcanic class. Besides their solid constituents, magmas always contain large amounts of water vapor and gases which exert a powerful solvent effect upon minerals; consequently they require less heat to maintain them in a state of fluidity than if acted upon by dry heat alone. The hot waters and vapors set free by the cooling of magmas doubtless have an important part in the formation of ore deposits. See IGNEOUS ROCKS; ORE DEPOSITS.

MAG′NA CHARTA, kär′tȧ, or GREAT CHARTER. The famous document granted by King John of England to the barons in 1215 and viewed by after ages as the basis of English liberties. The oppressions and exactions of a tyrannical sovereign called into existence a confederacy of the barons, or tenants in chief, of the crown, who took up arms for the redress of their grievances. Their demands were based on the charter voluntarily granted by Henry I at his accession in 1100, but added to this was a long list of demands for the removal of royal abuses or exactions which had come into existence since that time, or which had not been mentioned in that document. After several interchanges of messages a conference between the sovereign and the barons was held at Runnymede, near Windsor. King and barons encamped opposite each other; and after several days' debate John signed and sealed the charter with great solemnity on June 15, 1215. See ENGLAND; JOHN.

The Great Charter reared up a barrier against the abuse of the royal prerogative by a series of provisions for the protection of the rights and obligations of the feudal proprietor. It redressed a variety of grievances connected with feudal tenures, some of them now so long obsolete as to be with difficulty intelligible. There are minute provisions regarding the relief of heirs, wardship and marriage of heirs and heiresses, and marriage of the widows of tenants in chief. No scutage or aid is to be imposed without the authority of the common council of the Kingdom, except on the three great feudal occasions, of the King's captivity, the knighting of his eldest son, and the marriage of his eldest daughter. The liberties of the city of London and of other towns, boroughs, and ports are declared inviolable. Freedom of commerce is guaranteed to foreign merchants. Justice is no longer to be sold, denied, or delayed. The Court of Common Pleas, instead of, as formerly, following the King's person in all his progresses, is to be permanently fixed at Westminster; assizes are to be held in the several counties, and annual circuits are established. Regulations are made for the efficiency of the inferior courts of justice. The protection of life, liberty, and property from arbitrary spoliations is the most important feature of the charter. "No freeman shall be taken or imprisoned, or be disseised of his freehold, or liberties or free customs, or be otherwise damaged, nor will we pass upon him nor send upon him, but by lawful judgment of his peers, or by the law of the land"—a provision which recognized a popular tribunal as a check on the official judges, and may be looked on as the foundation of the writ of habeas corpus. No one is to be indicted on rumors or suspicion, but only on the evidence of witnesses. Protection is afforded against excessive amercements, illegal distresses, and various processes for debts and services due to the crown. The fines imposed are in all cases to be proportioned to the magnitude of the offense, and even the villein or rustic is not to be deprived of his necessary chattels. There are provisions regarding the forfeiture of lands for felony. Abuses connected with the royal forests were abolished by several provisions which were of so great importance as to lead to an incorrect statement by contemporary writers that a separate forest charter was granted. The independence of the Church is also provided for.

These are the most important features of that charter which occupies so conspicuous a place in history, and which establishes the supremacy of the law of England over the will of the monarch. From a distinctly constitutional point of view, however, the great importance of Magna Charta lay in its preserving the feudal idea of a contract between lord and vassals, between king and subjects, through the period of personal monarchy which was then already superseding the earlier Norman feudal monarchy, and thus making the development of the later parliamentary restrictions easy and natural.

The terms dictated by the barons to John included the surrender of London to their charge, and the Tower to the custody of the primate till August 15 following, or till the execution of the several articles of the Great Charter. Twenty-five barons, as conservators of the public liberties, were invested with extraordinary authority which empowered them to make war against the sovereign in case of his violation of the charter. Several solemn ratifications were required by the barons from Henry III and later rulers, and a copy of the Great Charter was sent to every cathedral and ordered to be read publicly twice a year. The copy preserved in Lincoln Cathedral is regarded as the most accurate and complete. The Great Charter and charter of the forests as issued in the reign of Henry III are printed with English translations, and prefixed to the edition of the statutes of the realm published by the Record Commission. Consult: Bémont, *Chartes des libertés anglaises* (Paris, 1892); D. C. Barrington, *Magna Charta and Other Great Charters of England* (2d ed., Philadelphia, 1900); William Stubbs (ed.), *Select Charters and Other Illustrations of English Constitutional History* (8th ed., Oxford, 1900); William Stubbs, *Constitutional History of England*, vols. i, ii (7th ed., Oxford, 1903); C. E. Petit-Dutaillis, *Studies and Notes Supplementary to Stubbs's Constitutional History* (Oxford, 1908); W. S. McKechnie, *Magna Carta: A Commentary on the Great Charter of King John* (2d ed., New York, 1914).

MAG′NA GRÆ′CIA (Lat., Great Greece, a translation of Gk. Ἡ Μεγάλη Ἑλλάς, *Hē Megalē Hellas*). The name given in ancient times to that part of southern Italy which was thickly planted with Greek colonies. The origin of the name is uncertain, though it has been plausibly conjectured that it was given by the Achæan colonists in remembrance of their former home in the little district which originally was called *Hellas*. The language of Polybius, in whose writings the term first occurs, implies that it was believed to have been in use as early as the sixth century B.C. Some later writers include under the term the Greek cities in Sicily; others restrict it to those situated on the Gulf of Tarentum, but in general it is used to denote only all the Greek cities in the south of Italy. The oldest settlement is believed to have been Cumæ—though it is doubtful whether it and its colonies, Dicæarchia and Neapolis, were really embraced under the designation Magna Græcia—which must have been founded near the end of the eighth century B.C. The Greek colonization of southern Italy seems to have begun a little later than that of Sicily, but the dates commonly given must not be considered as more than approximate. The earliest settlement, not reckoning Cumæ, was said to be Sybaris (founded by the Achæans, 721 B.C.); next, Croton (by the Achæans, 710 B.C.); then Tarentum (probably by Laconian Dorians; the traditional date 707 B.C. is wholly uncertain); Locri Epizephyrii (by the Locrians about 685 B.C.; see Locris); Rhegium (by the Chalcidians; date of origin not known, but believed by some to be older even than that of Sybaris); Metapontum (by the Achæans, 700–680 B.C.); and Siris (by Ionians from Colophon, about 650 B.C.; it seems to have been seized later by the Achæan colonies near by). Later Thurii was founded in 443 B.C. by Greeks from many cities, under the leadership of Athens. These cities became, in their turn, the parents of many others. See the separate articles on the cities named above.

Of the earlier history of Magna Græcia we know almost nothing. It is noticeable that, while the Greek cities in Sicily were on the coast and so were essentially mercantile, the Italian Greeks pushed into the fertile plains of the interior, subdued the native tribes, and developed great agricultural communities, with a land-owning aristocracy. Not that trade was neglected, for with the great development of these cities during the seventh, and especially the sixth century, they carried on an active commerce with the Greeks of the east, the Etruscans of the north, and the native races of the interior, exporting grain and other natural products and importing the manufactures of Asia Minor and Hellas. The region was also the seat of an active intellectual life. Pythagoreanism developed in Croton and for a time exercised a powerful influence on the political life of that city. (See Pythagoras; Pythagoreanism.) The Orphic theology seems also to have found here a favorable soil for its growth (see Orpheus), and at Elea the philosophers Xenophanes and Parmenides founded the Eleatic school (q.v.). The cities never formed a permanent union, though from time to time we find several joined in temporary alliance. On the contrary, the wars between them were often bitter and bloody and contributed largely to the decline of the whole region. In the fourth century B.C. the tribes of the north, especially the Samnites, the Bruttii, and the Lucanians, began to press hard on the border cities; at the same time Dionysius of Syracuse endeavored to make his influence supreme. From this time the history is simply a record of endeavors of one or another city to keep back the rising tide of invasion, often by calling in the aid of foreign leaders. The most famous example is the alliance between the Tarentines and Pyrrhus of Epirus against Rome. The failure of this effort led to the capture of Tarentum by the Romans in 272 B.C. After that the Roman influence in the peninsula was supreme. The Second Punic War, when the presence of Hannibal induced most of the Greek cities again to seek their independence, completed the ruin of the region, and the cities rapidly sank into decay. Consult François Lenormant, *La Grande-Grèce* (3 vols., Paris, 1881–84).

MAG′NA MA′TER (Lat., great mother). A name under which the goddess Cybele (q.v.) was worshiped at Rome. A sacred black stone was solemnly brought from Pessinus in Phrygia in 204 B.C., and a temple was built for it on the Palatine Hill, where its remains still exist. The festival of the goddess, the *Megalesia*, fell in April.

MAGNAN, mä′nyän′, Bernard Pierre (1791–1865). A French marshal, born in Paris. He entered the army in 1809 as a volunteer and served under Napoleon in Spain and Belgium till the defeat at Waterloo. He was colonel in the army which invaded Spain in 1823 and went to Algeria in 1830. Censured for lack of energy in dealing with an insurrection in Lyons in 1831, he entered the service of Belgium as general of brigade, but in 1839 returned to France and was implicated in the first attempt of Louis Napoleon at Boulogne. (See Napoleon III.) In 1848 he tendered his services to Louis Philippe, but later sided with the Republicans and was energetic in bringing the Army of the Alps to Paris in June of that year to repress a formidable insurrection under the Republic, and another at Lyons in 1849. He allied himself with Louis Napoleon when the latter became President of France, and as head of the Army of Paris (1851) was his efficient instrument in the coup d'état of Dec. 2, 1851. Napoleon made him Senator (1852) and marshal (1853).

MAGNAN, Valentin (1835–). A French psychiatrist, born at Perpignan. He graduated in medicine at Paris in 1866 and the following year was made doctor at the Sainte Anne Asylum in that city. From the outset of his career he devoted himself to the study of mental disorders, and he wrote a number of technical works, especially upon alcoholism, one of which was crowned by the Academy of Medicine (1874). He became a member of the Academy in 1893. His publications include: *Etude expérimentale et clinique sur l'alcoolisme* (1871); *Des diverses formes de délire alcoolique et de leur traitement* (1873; Eng. trans., *Alcoholism*, 1876); *Recherches sur les centres nerveux* (1876; 2d series, 1893); *Leçons cliniques sur l'épilepsie* (1882); *Leçons cliniques sur les maladies mentales* (1887; later rev. eds.); *La paralysie générale* (1894), with P. Sérieux; *Les Dégénérés* (1895), with Legrain. His best works were collected and appeared as *Leçons classiques sur les maladies mentales* (2d ed., 1893). Some of his writings were translated into German by Paul Julius Möbius under the title *Psychiatrische Vorlesungen* (Leipzig, 1891). Magnan was an editor of the *Traité international de psychologie pathologique* (3 vols., 1909 et seq.).

MAGNARD, mȧ'nyär', Francis (1837–94). A French journalist, born in Brussels. He was on the staff of the *Gaulois* (1859), the *Grand Journal*, the *Causerie*, and other journals before joining that of the *Figaro* (1863), and his series of critical articles on current literature called *Paris au jour le jour* were published in both the *Evénement* and the *Figaro*. He was editor in chief of the latter periodical from 1876 and raised it to a high standard of excellence, from which it declined after his death. He wrote an anticlerical romance, *L'Abbé Jérôme* (1869), and *Vie et aventures d'un positiviste* (1876).

MAGNE, mȧ'ny', Pierre (1806–79). A French statesman, born at Périgueux, Dordogne. He studied law at Toulouse and became, in 1835, counselor to the Prefecture of Dordogne. In 1843 he was elected to the Chamber of Deputies and quickly gained a reputation as a financier. He was Undersecretary in the War Department in 1847 and in the Department of Finance in 1849. In the February revolution he was a member of the right centre. He became Minister of Public Works in 1851–52, Minister of Commerce and Agriculture in 1853, and Minister of Finance in 1855, keeping office till 1863, the last three years without portfolio. In 1867 he came into power again as Minister of Finance. He was replaced in 1869 by Ollivier (q.v.); returned to office with Broglie in 1873, and held the Treasury for a year. In 1876 he was elected Senator for Dordogne.

MAGNENTIUS, măg-nĕn'shĭ-ŭs, Flavius Popilius. A Roman Emperor of the West (350–353 A.D.). He was of barbarian extraction, but soon rose to the rank of count under the Emperor Constantine the Great. Entering the service of Constans, son of Constantine the Great, Emperor of the West, he was put in command of the troops that defended the Rhine. Presently he plotted the overthrow of Constans. With the aid of Marcellinus, count of the sacred largesses, his plot was successful. Marcellinus having invited the officers of the army, stationed near the city of Autun, to a banquet in honor of the birthday of his son, at a late hour introduced Magnentius arrayed in robes of royalty. The cry "Long live Augustus" was raised by several conspirators, Constans was assassinated, and Magnentius took possession of the palace at Autun (Jan. 18, 350). In a short time Gaul, Italy, and most of the western provinces acknowledged the usurper as Emperor. Constantius II (q.v.), the brother of Constans, and Emperor of the East, hastened to avenge the death of his brother and totally defeated Magnentius before the town of Mursa on the Drave, 351. Magnentius fled to Italy, thence to Gaul, where Constantius followed him, and again in 353 defeated him in the Cottian Alps. On the eve of being captured by his enemies, and deserted by the countries that had acknowledged him, he committed suicide at Lugdunum (Lyons), Aug. 11, 353. Constantius thus became master of the whole Empire. Consult *Cambridge Mediæval History*, vol. i (New York, 1911).

MAGNES, măg'nēz (Lat., from Gk. Μάγνης). An Athenian writer of comedies, who flourished in the earlier half of the fifth century B.C. He is the first comedian of whom we know that he won a dramatic prize; he introduced fantastic imitations of animals as part of the costume and the dances of the comic chorus. He was at first highly popular and won the first prize 11 times; but, according to Aristophanes (*Knights*, 520 ff.), he later lost his popularity.

MAGNE'SIA (Lat., from Gk. Μαγνησία). In ancient geography, the eastern district of Thessaly (Map: Greece, Ancient, C 2). It is a narrow and rocky strip of coast land, south of the Peneus and the Vale of Tempe and bordered on the west by Ossa and Pelion and by the Pagasæus Sinus. The Magnetes seem to have emigrated in part to Asia Minor, when the Thessalians occupied the region. Those who remained, while acknowledging Thessalian supremacy, were neither reduced to serfs (Penestæ) nor made members of the Thessalian confederacy, but were included among the allies. See Thessaly.

MAGNESIA. The name of two ancient Greek cities of Asia Minor. 1. The first was in the northern part of Lydia, near the Hermus, about 40 miles northeast of Smyrna, at the foot of Mount Sipylus, and was called Magnesia near Sipylus (Magnesia ad Sipylum), to distinguish it from the other (Map: Greece, Ancient, E 2). It seems to have been settled by Magnetes from Thessaly during the Æolian colonization, but, as was natural in a Greek city so far inland, it early fell under Lydian rule. It regained its prominence under the Seleucid kings of Syria and was the scene in 190 B.C. of a great battle in which the Romans defeated Antiochus III (Antiochus the Great). It was nearly destroyed by an earthquake in the reign of Tiberius, but was rebuilt and under the Byzantine emperors flourished greatly. After its capture by the Seljuks and later by the Ottomans, it retained its importance. Under its modern name, Manissa, it is a flourishing town with fine buildings, on the Smyrna-Alashehr Railroad. In this region, on or near Mount Sipylus, Greek legend located the Kingdom of Tantalus and the myth of Niobe. There are remains of very early settlements on the slopes of Mount Sipylus. 2. The second city of Magnesia was in Caria, in the valley of the Mæander, and was called Magnesia on the Mæander (Magnesia ad Mæandrum), to distinguish it from that near Mount Sipylus (Map: Greece, Ancient, E 3). It was about 15 miles from Ephesus and from Miletus. This city seems also to have been a colony of Magnetes, whose wanderings through Delphi and Crete to Asia were part of the legendary history of the city. It early became wealthy and powerful, but was destroyed in the first half of the seventh century B.C. by the Cimmerians (q.v.). Having been rebuilt, it was afterward conquered by the Persians. King Artaxerxes I assigned it to Themistocles as a residence; after Themistocles' death here, about 460 B.C., the inhabitants paid him honors as to a hero. In the neighborhood was a celebrated temple of Artemis Leucophryne. When about 400 B.C. the old site of the city was for some reason abandoned, the inhabitants withdrew to the higher ground around the temple, where a new city was built, which, though never very prominent, was later the seat of a bishopric. The temple was Ionic and of great beauty. Part of its sculptured frieze, representing the Amazons, was brought to the Louvre by Texier (q.v.), and the rest is in Constantinople. Excavations conducted for the Berlin Museum by Dr. Humann in 1891–93 laid bare the temple and also brought to light ruins of the Agora, theatre, gymnasium, and other buildings, as well as many inscriptions, including one containing the legendary account of the founding of the city. Under the Kings of Pergamos Magnesia still flourished. It helped Sulla against Mithridates. Under the Roman emperors it steadily declined. At present the city is most unhealthful. Consult: Kern, *Die Gründungsgeschichte von Magnesia am Maiandros* (Berlin, 1894); id., *Die Inschriften von Magnesia am Mæander* (ib., 1900); Carl Humann, *Magnesia am Mæander* (ib., 1904). For both cities, consult: the article "Magnesia," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914); Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern*, 346, 396 (2d ed., ib., 1914)—on page 396 is a plan of Magnesia ad Mæandrum.

MAG′NESITE (from *magnesium*). A magnesium carbonate that crystallizes in the hexagonal system and is isomorphous with calcite, dolomite, and siderite; it has a vitreous lustre and is either white, light yellow, or brown in color. Crystals of magnesite are rare, it being usually found in the form of irregular veins in serpentine and other magnesium rocks, being a deposition product either of the serpentine itself or of the original rock from which the serpentine is derived. It is found in many localities in Moravia, Styria, Silesia, and Norway; and in the United States in Maryland, New York, New Jersey, California, and Washington. This mineral finds considerable use in the preparation of magnesian compounds, such as Epsom salts, magnesia, and in the manufacture of paint, paper, and fire brick; also to some extent as an adulterant for the cheaper grades of soap. A variety containing iron is called *breunnerite*, or *brown spar*.

MAGNESIUM, măg-nē′zhĭ-ŭm *or* -shĭ-ŭm (Neo-Lat., from *magnesia*, from Gk. *μαγνησία* [sc. *λίθος*], *magnēsia* [sc. *lithos*], magnesian [sc. stone], magnet, from *Μαγνησία*, *Magnēsia*, a district in Thessaly, where magnetic stones abounded). A metallic element first isolated by Davy in 1808 and prepared in larger quantity by Bussy in 1830. Certain isolated salts of magnesium were known in the seventeenth century, the sulphate, e.g. (Epsom salt), having been found in the mineral waters at Epsom, England. The element is not found native, but its compounds are widely distributed as the minerals *magnesite* or magnesium carbonate, *dolomite* or magnesium-calcium carbonate, *kieserite* or monohydrated magnesium sulphate, *kainite* or magnesium sulphate with potassium chloride, *carnallite* or magnesium-potassium chloride, as well as numerous other minerals, containing smaller quantities. Magnesium also forms the chief constituent of many silicates, such as *augite, hornblende, olivine, serpentine, tourmaline*, and *meerschaum*. It is further found in the bones of animals and in the seeds of the cereals. The metal itself may be obtained by heating magnesium chloride with metallic potassium in a platinum crucible and washing out the resulting potassium chloride with water. It may similarly be made by the action of metallic sodium on magnesium chloride, but it is more cheaply obtained electrolytically. A mixture of carmallite (magnesium-potassium chloride) and common salt is fused and heated for a time with carbon; then ammonium chloride is added, and the fused mass is subjected to electrolysis, the positive electrode (when the chlorine is given off) being of carbon, while the iron cell containing the fused mass serves as the negative electrode and receives the metallic magnesium. To purify it, the metal is heated with molten carnallite.

Magnesium (symbol, Mg; atomic weight, 24.32) is a silver-white, lustrous, hard metal that is malleable and ductile, has a specific gravity of 1.75, and melts slightly below 800° C. (1472° F.). It is used in photography, signaling, and pyrotechny, as it burns readily when in the form of filings, wire, or ribbon, with a white light of great brilliancy; thus, a burning magnesium wire of 0.297 millimeter thickness produces a light equal to 74 stearin candles. Ordinarily the metal contains, in occlusion, considerable quantities of hydrogen gas and carbon monoxide, which are given off on heating. Magnesium combines with various other metals to form alloys, the most interesting of which are those with potassium and sodium, which decompose water at ordinary temperatures. A silver-white alloy of aluminium and magnesium, called *magnalium*, has been recommended for lens mountings, spectacles, etc. When ignited in the air or oxygen magnesium forms an *oxide*, MgO, which is a white, light, infusible, amorphous powder that is extensively used in the manufacture of crucibles, cupels, fire bricks, etc. It is also used, like lime, for the production of a light similar to the calcium light. (See DRUMMOND LIGHT.) The commercial article is obtained by prolonged ignition of the carbonate or the hydrate, both of which are derived from the saline deposits of Stassfurt, Germany. The oxide, as well as the carbonate, of magnesium finds use in medicine as a laxative and antacid. When mixed with water, the oxide gradually changes into the *hydrate*, which is also found native as the mineral *brucite*. The hydrate is used for extracting sugar from molasses, forming an insoluble, granular, crystalline magnesium saccharate, which, when decomposed by carbon dioxide, yields pure sugar. The *carbonate*, which is known commercially as *magnesia alba*, is prepared by precipitating either the sulphate or the chloride with sodium carbonate. The *sulphate*, which occurs as the purgative principle of various spring waters, is obtained commercially from the minerals kieserite and epsomite, or by decomposing dolomite with sulphuric acid. This salt (as Epsom salt) is largely used as a fertilizer, as a refrigerant cathartic in medicine, for dyeing with aniline colors, and for warp-sizing cotton. The *chloride*, which occurs native with potassium chloride as carnallite in the Stassfurt deposits, is used by cotton spinners as a thread lubricator and as a source for other magnesium salts. The *citrate*, which is official in the United States Pharmacopœia, is used in medicine as a laxative. Magnesium also forms an extensive series of metallo-organic compounds which are now widely used in synthetic organic chemistry. See GRIGNARD REACTION.

MAGNESIUM LIMESTONE. See DOLOMITE.

MAG′NET. A substance which has the power of attracting iron, nickel, cobalt, and certain other substances. A magnet may be either natural, as in the case of loadstone, or artificial, as in the case of magnets produced from iron or steel. See MAGNETISM.

MAGNETES. See both articles MAGNESIA.

MAGNET′IC CURE (from Lat. *magnes*, from Gk. *μάγνης*, magnet, from *Μαγνησία*, *Magnēsia*, a district in Thessaly, where magnetic stones abounded). It was held by physicians of old that the magnet exercised an important influence on the human body or on the bodies of certain persons; this being shown in the alleviation of headache, toothache, cramps, etc. It has, however, been proved that the magnet as such has no influence on animal organisms, and that accordingly all cures professedly resting on such action have been due to delusion or deceit. But it is quite otherwise with magneto-electricity and galvanism. Consult Peterson and Kenelly, "Magnetism," in *New York Medical Journal* (New York, 1892). See ELECTRICITY, MEDICAL USES OF.

MAGNETIC ELEMENTS. The quantities defining the earth's magnetic field, such as the magnetic declination, the magnetic inclination or dip, and the strength of the field. See COMPASS; DECLINATION; INCLINATION; TERRESTRIAL MAGNETISM.

MAGNETIC EQUATOR. A line supposed to be drawn on the earth's surface connecting the points at which a dipping needle assumes a horizontal position, i.e., where the magnetic *dip* (q.v.) is zero. It is a rather irregular curved line crossing the geographic equator in several places, but never receding from it more than about 16°. It is shown on the map of equal magnetic inclination in the article TERRESTRIAL MAGNETISM (q.v.). See also COMPASS; DEVIATION; ISOCLINIC.

MAGNETIC IRON ORE. See MAGNETITE.

MAGNETIC MERIDIAN. See COMPASS; DECLINATION; TERRESTRIAL MAGNETISM.

MAGNETIC MOUNTAIN. In the *Arabian Nights*, a mountain which attracted passing ships and by its magnetic power drew out the nails and fastenings and so destroyed the vessels. The tale appears in various works of literature.

MAGNETIC NEEDLE. See COMPASS; DEVIATION; MAGNETISM; TERRESTRIAL MAGNETISM.

MAGNETIC NORTH. See COMPASS; DECLINATION; TERRESTRIAL MAGNETISM.

MAGNETIC OBSERVATORY. An observatory whose chief purpose is to register, usually by photographic means, the variations, or fluctuations, of the earth's magnetism. See MAGNETOGRAPH; TERRESTRIAL MAGNETISM.

MAGNETIC POLES. See COMPASS; ISOCLINIC; TERRESTRIAL MAGNETISM.

MAGNETIC SEPARATORS. See ORE DRESSING.

MAGNETIC UNIT POLE. See MAGNETISM; ELECTRICITY, *Laws of Steady Electric Currents.*

MAG′NETISM. The name "magnet" is given any body which possesses the power of attracting pieces of iron. There are certain natural ores which have this power, but all magnets actually in use are artificial. The origin of the use of a magnetic compass as a means of obtaining approximately the direction of the geographical North Pole of the earth is unknown, but the first scientific work on the laws of magnets was done by William Gilbert (1540–1603), who published his researches and ideas in his great book *De Magnete.* Since his time the most important work has been done in connection with electric currents. (See ELECTRICITY.) Several attempts have been made to explain magnetism, i.e., to explain the magnetic action of a molecule of a magnetic substance by some electrical theory. Ampère advanced the idea that in each such molecule there is an electric current flowing in a fixed path. This idea is not, however, in accord with modern conceptions of the nature of a molecule. Weber tried to account for diamagnetism by the idea of induced electric currents in the molecules. A more modern theory is one in which molecular magnetism is regarded as due to rotation of electrons inside the atoms of magnetic substances. Weiss has recently shown that such atoms may be considered made up of a number of elementary magnets, called "magnetons"; thus, an atom of iron consists of a definite number of magnetons, an atom of nickel of a different number, etc. Langevin has extended this electronic theory and shown how it may explain all the main phenomena of magnetism.

In addition to attracting iron, magnets attract pieces of other kinds of matter, e.g., nickel, cobalt, manganese, chromium, and a few others, while they repel small pieces of bismuth, antimony, silver, and a few other substances. It was shown by Faraday that the question of repulsion or attraction depended entirely on the relative magnetic properties of the substance which is being acted on by the magnet and the material medium in which it is immersed—this last is, of course, generally air. Those bodies which when surrounded by air are attracted towards a magnet are called "magnetic" or "paramagnetic" substances; while those which under similar circumstances are repelled are called "diamagnetic." (See DIAMAGNETISM.) Faraday showed, too, that there is in neither case attraction or repulsion if the magnetic field is "uniform," i.e., if there is the same magnetic force felt at each point of the surrounding air.

There are two methods in general use for making artificial magnets: one is to take a bar or a needle of a magnetic substance, e.g., iron or steel, wrap an insulated wire around it like thread on a spool, and pass a strong electric current through the wire; the other is to take as before a bar or a needle of a magnetic substance and place it near a magnet. (A modification of the latter method will be described later.) The intensity of the magnetization is increased in both cases by hammering the bar while the magnetizing action is going on. It is found that a piece of steel magnetized in this way remains so for a long time, while a piece of iron loses its magnetization.

If a number of such bar magnets or magnetic needles are made, the following facts may be observed: If a magnet in the form of a bar or needle is suspended so as to be free to rotate around a vertical pivot, as in the mariners' compass (q.v.), it will turn and place itself in a generally north and south direction. The end of the magnet which points towards the north is called the "north pole" of the magnet; and the other, the "south pole." This proves that the earth itself has magnetic actions; and the plane which includes the centre of the earth and the direction of the magnetic needle at any point on the earth's surface is called the "magnetic meridian" at that point. It should not be thought that the "poles" of a bar magnet are definite points. Magnetic forces may be felt over the whole magnet, but of course more intensely near the ends. In any definite case the resultant of all these forces on any one outside body will pass through a certain point in the magnet, but this point will change with the position of the outside body.

If this magnet is floated on water, it is found that there is no translation, simply a rotation around a vertical axis. The magnetic field due to the earth must be uniform for any limited region on the earth; and this experiment proves that in a uniform field the forces acting on the two ends of a bar magnet are equal and opposite. This is sometimes expressed by saying that the north and south poles of a bar magnet have equal "strengths."

If a bar magnet is broken in two, both parts are magnets with poles at the ends. This leads to the idea that magnetism is a property of the molecules of the magnetic body. In fact, when a bar of iron is magnetized, its volume changes, its elasticity changes, etc.; if it is magnetized and demagnetized rapidly by using an alternating current in the magnetizing helix, its temperature rises. (If the temperature of a magnet is raised to red heat, it loses its magnetization.) Further, if a magnet is jarred or twisted, or if its temperature is raised, its magnetization is altered. In short, any physical action which affects the molecules of a magnet alters its magnetization; and any change in the magnetization alters the molecular properties. This establishes the fact that magnetism itself is a molecular property; and that if a molecule of a magnet could be obtained, it would have a north and a south pole like those of a bar magnet. It is impossible, therefore, to obtain a north pole apart from its equivalent south pole. There are no such forms of matter as magnetic conductors which enable the poles to be separated. This fact is illustrated by the phenomenon of induction described below.

If two bar magnets are brought near each other, it may be shown that like poles repel each other, and unlike poles attract each other; and further the action of a north pole of any one magnet on the north pole of another is equal and opposite to that of the south pole if the former is placed at the same distance from the north pole of the second magnet.

If a bar magnet is placed in air, and if a piece of any matter different from air is brought near it, this piece is observed to manifest magnetic forces at different points; it is said to be magnetized by "induction," and the forces of attraction or repulsion ordinarily observed with magnets acting on iron, etc., are due to the presence of these "induced charges" of magnetism. If the piece of matter is of iron or any magnetic material, it is magnetized in such a manner that, if it is nearest the north pole of the magnet, its face which is next this pole is a south pole. (If the piece of matter is bismuth, the opposite is true.) It is perfectly easy to explain the induction of iron or other magnetic substances if it is assumed that each molecule of the magnetic substance is a magnet. Then, before this body is put near the magnet, the molecular magnets are standing at random, and there is no external action; but when it is brought near the magnet, each molecular magnet is acted upon by a couple which tends to make it turn and point towards the magnet, its south end being attracted towards the magnet's north pole. By this action all the little magnets are more or less arranged in order; and at the end near the north pole of the magnet there will be almost nothing but south poles of the molecules, etc. All the facts of magnetization of iron, e.g., saturation, hysteresis (q.v.), etc., can be explained by this idea of the molecules of iron, nickel, etc., being themselves magnets.

If a bar of iron is placed lengthwise between two magnets, connecting two opposite poles, and if two bar magnets with their opposite poles together are held nearly vertically at the middle point of the iron bar and then drawn slowly apart along the iron bar, it becomes magnetized, especially if the process is repeated several times. This is known as the method of "divided touch." Its explanation is evident from the theory of molecular magnets.

It is observed that, if a small magnet is pivoted, free to turn, inside a helix of wire, it will place itself parallel to the axis of the helix when an electric current is passed through the latter. It is evident, then, why a bar of iron placed through the helix becomes magnetized by the action of an electric current.

The law of action of magnets on each other may be given if the words "equal poles" and a unit magnetic charge or "unit pole" are defined. Two magnetic poles are defined as being equal if they have the same action on any third pole; and a unit pole is chosen to be such that when acting on another unit pole at a distance of 1 centimeter in a vacuum the force is 1 dyne. To find the numerical value to give any pole it is necessary to find what combination of unit poles has the same action on a third pole. Experiments then show that the action of a pole whose magnetic charge is m upon one whose charge is m' at a distance r centimeters apart varies directly as the product mm' and inversely as r^2 and is different for different surrounding media. This law may be expressed $f=\frac{mm'}{\mu r^2}$, where μ is a quantity which differs for different material media. It is called the "magnetic permeability" or the magnetic "inductivity." (Cf. the quantity K in *Electrostatics* under ELECTRICITY.)

The dimensions of a magnetic charge may be at once found. The square of a charge has the dimensions of $\mu r^2 f$, i.e., μL^2MLT^{-2}. Hence the charge itself has the dimensions $L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}\mu^{\frac{1}{2}}$.

This law of magnetic action has been verified approximately by Coulomb, it being called his law, so far as the statement that the force varies as $\frac{mm'}{r^2}$ is concerned, and later by Gauss, who used an indirect method, and by the countless experiments and calculations made daily by electrical engineers. The importance of recognizing the effect of the surrounding medium was first emphasized by Faraday.

The region around a magnet is called its "field of force"; the "intensity" of the field at any point is the force which would act on a unit north pole if placed there; the "direction" of the field is the direction of the intensity; a "line of magnetic force" is a line drawn in a magnetic field so as to indicate by its direction at any point that of the field at that point; a "uniform field" is one in which the lines of force are all parallel, and the intensity is the same at all points. Such a field is a limited region on the earth due to magnetic action of the earth, or the space between the poles of a horseshoe magnet or between the field magnets of a dynamo. The intensity of any uniform field may be measured by several means; the best for many reasons is that of Gauss. If a magnet of any kind or shape is suspended in a uniform magnetic field, free to turn around an axis perpendicular to the direction of the field, it will turn and take some definite position; in order to keep this magnet in a position at 90° from this against the action of the field of force will require the application by some external agency of a certain couple or moment; the amount of this couple, if the intensity of the uniform field is unity, is called the "magnetic moment" of the magnet about the given axis. If the magnet is uniformly magnetized—i.e., if in case it is broken into two, three, etc., equal parts, they will all be alike in every way—the magnetic moment divided by the volume of the magnet is called its "intensity of magnetization." If the magnet is a bar or rod or wire, uniformly magnetized, so that there is no magnetization except at the ends, it is called a "solenoid," and the distribution of magnetic charges is called "solenoidal" (thus, the magnetic action of a long helix of wire carrying an electric current is approximately solenoidal). If the magnet consists of a thin sheet with all the molecular magnets side by side, having their north poles on one face of the sheet and their south poles on the other, it is called a "lamellar" distribution. (Thus, the magnetic action of a single loop of wire carrying an electric current has this lamellar property.)

Lines of magnetic force may be drawn by placing a small magnetic needle at different points in the field of force and noting its direction. Still another method is to sprinkle iron filings through the field, e.g., over a glass plate or smooth piece of paper; each filing becomes magnetized by induction, and if the filings are jarred slightly each will turn and place itself along the line of force at the point where it is. (Actually there will be a force of attraction towards the magnet; but it is resisted by the friction between the filing and its supporting plate or paper.) It may be observed immediately that lines of force join opposite poles of magnets in the air; and, since the molecules of a magnetic substance are also magnets, the lines of force can be imagined as proceeding from molecule to molecule inside the magnet. In this sense lines of magnetic force are continuous closed curves—not like lines of electric force which end on charged surfaces. Tubes can be imagined constructed, by choosing somewhere in a magnetic field a small closed curve and drawing through each point of it the line of force. Such tubes are continuous and closed like an ordinary piece of rubber tubing with its two ends brought together. If the cross section of these tubes is so chosen that the number passing out at the north pole of a magnet on which there is a magnetic charge m is $4\pi m$, they are called "tubes of induction." It is shown in electricity that if the number of such tubes passing through a closed circuit of wire is changed, there will be an induced current in the metallic circuit; the total quantity of electricity carried by this current varies directly as the change in the number of tubes of induction. This gives the simplest and most accurate method of determining the distribution of magnetic charge over the surface of a magnet. If the magnet is in the form of a rod, a coil of wire having its two ends joined to a galvanometer may be slipped over it. The tubes of induction enter the magnet wherever there is any south magnetic charge, i.e., where the south poles of the molecular magnets reach the surface, and leave it where there is any north magnetic charge, i.e., where the north poles of the molecular magnets reach the surface. Tubes are crowded together about the middle of the rod and then escape at the sides and north ends, returning into the sides and the other pole of the rod. As the small exploring coil is pushed along the rod from the centre to the north end, the number of tubes inside decreases, owing to the passage out from the rod of the tubes of induction; the induced quantity of electricity measures the decrease in the tubes, i.e., the number of tubes leaving the sides of the magnet, and therefore the magnetic charge over them, because a unit charge corresponds to 4π tubes.

The energy of a magnetic field is identical with that associated with an electric current. (See ELECTRICITY.) Whenever attraction or repulsion is observed to take place, the motions must be such as to decrease the potential energy and increase the kinetic, at least temporarily.

Magnetic Properties of Iron. We have seen that when an electric current is sent through a coil or spiral of wire the coil is found to have the properties of a magnet; that is to say, it will attract bits of iron, deflect a magnetic needle, etc. The region around the spiral when the current is flowing in it is called a magnetic field. The intensity or strength of the field is defined as the force which would act on a unit north pole, and so varies from point to point in the neighborhood of the spiral. In describing this field the convention has been adopted of imagining the field traversed by lines of force which indicate by their direction the path the unit north pole would follow if free to move. When the field has unit strength, it is said to contain one line of force per square centimeter perpendicular to the

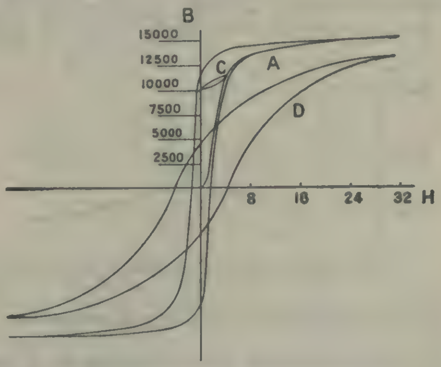


FIG. 1. CURVES OF MAGNETIZATION.

direction of the line. It may be shown that the intensity of the field, or the number of lines of force per square centimeter within the spiral carrying the current, is represented by the formula $H = 0.4\pi ni$, H being the intensity of the field, n the number of turns per unit length of the spiral, and i the current strength in amperes.

If now the coil is wound on a core of iron, nickel, or cobalt, its properties as a magnet are found to be greatly intensified; that is to say, the number of lines of force per square centimeter is increased, i.e., the core has become magnetized. The number of lines of force per square centimeter within the core is called the *induction* and is usually designated by the letter B. The ratio of the induction B to the intensity of the field H is called the *permeability*, μ; i.e., $B = \mu H$. For air B is evidently equal to H, since we have defined H as the number of lines of force per square centimeter when the coil has no core. Thus, μ for air is equal to 1.

The permeability μ differs widely in different materials and in any one material may vary widely with the induction B. For in any one of the metals above mentioned with a uniformly increasing H, B increases at first slowly, then rapidly, then slowly again, entering a region in which the increments of B are exactly equal to the increments of H. In this region the material is said to be saturated. This process is shown in the curve A in Fig. 1. It will thus be noticed that with increasing values of H the ratio of B to H varies widely. In Fig. 2, a curve is given which shows the variation of the permeability in a given specimen of iron for different values of H; as indicated, μ increases rapidly at first, corresponding to the rapid increase in B, then decreases, corresponding to the portion of the BH curve in which the material is approaching saturation. The values of the permeability and so of the induction which may be attained in iron are greatly in excess of those obtainable in other materials, and this together with the fact that it is so much more common in nature has led to its widespread adoption in the construction of electric machinery and all apparatus in which it is necessary to have strong magnetic fields.

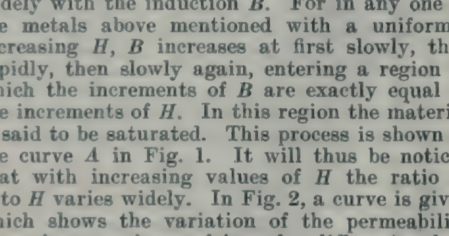


FIG. 2. CURVE SHOWING VARIATION IN PERMEABILITY.

The behavior of iron when subjected to a magnetizing force is usually represented by the curve between the induction B and the intensity of the force H mentioned above. Such a curve taken from a particular sample of soft iron is shown in curve A in Fig. 1. With iron in the neutral state, i.e., starting from $H = 0$, with increasing H, B increases slowly at first, then very rapidly, then more and more slowly, the curve approaching a slightly inclined straight line a little above 15,000. This is the region commonly spoken of as the saturated state; i.e., although H may be continually increased, the corresponding increase in B does not exceed that of H. If now H be decreased, the values of B will not traverse the same path that they did for increasing H, but the values of B will be higher for the same value of H than those on the ascending curve. When H is reduced to zero again, B has still a considerable value, i.e., about 11,000. There is thus within the iron a considerable amount of residual magnetism. If now H is increased in a reverse direction, B may be brought to zero, and, on still further increase of H, begins to increase in the other direction; i.e., the lines of force now pass through the iron in the opposite direction. The value of H which is required to reduce the residual magnetism, i.e., to bring B to the zero value, is called the coercive force. When H is increased in the reverse direction, the induction B traces the same form of curve as during the original ascent of H; that is to say, it increases rapidly for low values of H and then gradually approaches the region of saturation. If H is now decreased again, there is found to be a residual magnetism of about the same amount, but of opposite sign to that before found. If H is now increased in the same direction as at the starting of the process, the residual induction is reduced to zero only by a definite positive value of H. A further increase of H results in the rapid increase of B, and the curve finally merges into the original ascending curve. If now the same cycle of processes be gone through, the induction will traverse the same paths. The cycle then forms a closed curve of definite area. If at any point in the curve, such as the point C, H be decreased, B does not decrease over the path of increase, but tends to hold its value, or *lags* behind the change in H. On increasing H again the lower part of loop C is formed, and on further increase the path joins the original curve. This tendency of B to hold its value, or to lag behind H and so to form closed loops, is called *hysteresis*. When iron is carried through the hysteresis cycle, there is a loss of energy due to molecular friction and work done against other molecular forces consequent upon the reversal of direction of magnetization. This energy loss is manifested in a heating of the iron. It may be shown that this loss in ergs per cycle is proportional to the area of the hysteresis curve.

The magnetic properties of iron vary widely for different specimens. These variations depend, in the first place, on the past history of the material; that is to say, whether it has been annealed, hardened, stretched, twisted, or subjected to any treatment which would be likely to affect the molecular structure. In the second place, they depend on the chemical composition; that is to say, the presence or absence of such substances as manganese, carbon, etc. In general it may be stated that the softer the iron the greater the values of B and μ which may be obtained. The curve A (Fig. 1) is taken from a test on an average specimen of good soft iron. The maximum value of B is about 15,000, the maximum μ about 245, corresponding to $H = 4.5$. The whole curve in this case is unusually narrow and therefore incloses a small area, showing that in soft iron B follows H with greater readiness than in harder specimens, and that the loss due to hysteresis is smaller. When subjected to a magnetizing force, the behavior of soft iron is particularly sensitive to any kind of mechanical disturbance. Thus, if the specimen be lightly tapped while any given value of *H* is applied, the corresponding value of *B* may be largely increased. It retains considerable residual magnetism if undisturbed, but this residual practically disappears if the iron is tapped or heated, or the molecular structure is disturbed in any way. If soft iron is mechanically hardened in any way, that is to say, if it is hammered, rolled, stretched, or twisted, its permeability and value of residual magnetism are much lessened, and the coercive force is increased.

If, while the iron is on the descending part of the hysteresis curve and so has the higher value of *B* for any given value of *H*, an electric oscillation is caused to pass through a coil surrounding the specimen, it is found that the value of *B* drops suddenly to the lower value, i.e., the value on the ascending part of the curve. The electric oscillation sets up a molecular disturbance. This fact is made use of in the magnetic detector used in wireless telegraphy. The sudden decrease in induction is used to induce an electric impulse in an auxiliary circuit containing a telephone. The effect of hardening is shown in curve *D* (Fig. 1), which is taken from a test on the same sample of iron which gave the curve *A* after it had been subjected to a hardening process of rolling and stretching. It will be noticed that the maximum values of *B* are lessened, the permeability is less throughout, the residual magnetism is less, the coercive force greater, and the area of the closed curve appreciably larger.

When iron is subjected to such mechanical treatments as those mentioned above, and to annealing, hardening by quenching, tempering, etc., the various resulting grades of steel have widely different magnetic qualities aside from those due to differences in chemical composition. Speaking generally, a mild or soft steel is also magnetically soft; that is to say, μ is high and the coercive force low. The harder the steel the greater its magnetic hardness. This has been already illustrated in the two curves given above. If two samples of steel differ in the amounts of carbon contained in them, the one having the greater amount is both mechanically and magnetically the harder, the permeability is lower, the coercive force higher. For this reason permanent magnets are made of steel. Also a specimen hardened by tempering is found to be much harder than one of the same chemical composition which has been annealed.

Other substances than carbon affect the magnetic quality of iron, sometimes very greatly; chromium and tungsten increase the coercive force tremendously. For this reason tungsten is generally used in magnet steel. The coercive force in soft iron is about 2, while that in tungsten steel may exceed 50. Cast iron reaches a somewhat lower magnetization than wrought iron or steel, even for high values of *H*. When saturated, *B* is about three-quarters of the best values in iron. For moderate values of *H* in permeability and coercive force it generally resembles mild steel.

In certain alloys of iron there is a marked absence of magnetic quality. The presence of manganese in large quantities is particularly detrimental. Thus, in manganese steel, which contains about 12 per cent of manganese and 1 per cent of carbon, the permeability is only about 1.4 and is fairly constant in weak and strong fields; also there is practically no residual magnetism. Nickel steel is also most remarkable. A specimen containing 25 per cent of nickel was found to be practically nonmagnetic under ordinary conditions of temperature, its permeability being practically constant at 1.4. Thus, we have an alloy of two metals, each itself strongly magnetic, which has a practical absence of all magnetic quality. This alloy is also interesting in the further fact that when cooled to very low temperatures it becomes strongly magnetic and remains so after the temperature rises to ordinary values.

The effect of increase of temperature generally is to increase the magnetic properties of iron when the magnetizing force is low. This increase continues up to a temperature of 775° C., and beyond this temperature the iron suddenly becomes practically nonmagnetic. This temperature is known as the critical temperature of magnetization, and the evidence is plentiful from other facts that there is a decided molecular change in the structure of the iron at this point. For instance, this is the region known as the point of recalescence in the cooling of iron from white heat. The suddenness of this loss of magnetic quality with temperature is less as the magnetizing force is greater, and for large values of *H* it may even happen that the permeability decreases with increase of temperature.

We have seen that the area of the loop of hysteresis represents a loss of energy. This fact is of no special importance if the magnetization is constant and in one direction; but if the magnetization varies, or if it reverses many times per second, as is frequently the case in electrical apparatus, this loss may be quite appreciable. Thus, in the magnetic circuits of dynamo-electric machines the magnetization in the fields is always in one direction, and hence wrought iron of high permeability is used. In the armatures, however, and in alternating current apparatus in which the induction rapidly changes direction, the loss may be quite great, and it directly affects the efficiency of the machine. (See DYNAMO-ELECTRIC MACHINERY.) Hence, in these latter cases, the iron is worked at lower induction and must be soft so as to give a narrow hysteresis curve. Steinmetz has expressed a convenient law for this loss. It is stated in the formula $W = \eta B^{1.6}$. *W* is the loss in ergs per cycle, *B* is the maximum induction, and η is a constant of the material; η varies from 0.00124 to 0.0055 and for good annealed iron has an average value of 0.0033. It may be as high as 0.015 for steel and 0.08 for tungsten and manganese steel. Thus, at 60 cycles per second if

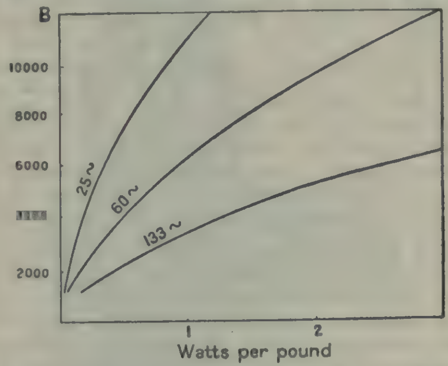


FIG. 3. CURVES SHOWING LOSSES OF ENERGY IN IRON.

the induction be 6000, for $\eta = 0.0033$ the loss in 100 cubic centimeters would be 2.1×10^7 ergs per second, or 2.1 watts. Closely allied with the hysteresis loss for alternating magnetization is the so-called Foucault or eddy-current loss. When the induction alternates, it induces currents in numerous little closed paths in the body of the iron due to its electrical conductivity. These currents therefore cause a loss of energy. To diminish these losses the iron is laminated so as to cut down the number of closed circuits in the body of the iron. In measuring iron losses due to alternating magnetization it is very difficult to separate these losses. In practice they are measured together, and the curves shown in Fig. 3 give the loss per pound of good soft sheet steel 0.011 inch thick at different inductions for 25, 60, and 133 cycles per second. See HEUSLER ALLOYS.

Bibliography. See the books of reference mentioned in the article ELECTRICITY, and in addition Heinrich DuBois, *The Magnetic Circuit in Theory and Practice,* translated by Atkinson (London, 1896); J. A. Ewing, *Magnetic Induction* (ib., 1900); H. E. Hadley, *Magnetism and Electricity* (New York, 1905); Houston and Kennelly, *Magnetism* (2d ed., ib., 1906); J. H. Jeans, *Mathematical Theory of Electricity and Magnetism* (2d ed., ib., 1912); C. M. Jansky, *Elementary Magnetism and Electricity* (ib., 1914). Royal Society of London, *Catalogue of Scientific Papers: Electricity and Magnetism* (London, 1900 et seq.) is invaluable.

MAGNETISM, ANIMAL. See HYPNOTISM.

MAGNETISM, TERRESTRIAL. See TERRESTRIAL MAGNETISM.

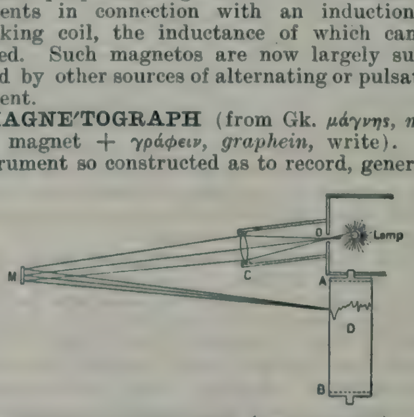
MAG′NETITE, or MAGNETIC IRON ORE. An oxide of iron (Fe_3O_4) containing 72.4 per cent metallic iron. It has an iron-black color, bright to dull metallic lustre, hardness of from 5.5 to 6.5 on the mineral scale, and a specific gravity of from 5.17 to 5.18. The crystalline form is isometric, commonly octahedra and dodecahedra, but it also occurs massive and in granular aggregates. Magnetite is readily distinguished from other iron-ore minerals by its strong magnetic properties; and in some cases it also exhibits polarity, being then known as loadstone. It is difficultly fusible (1225° C.), and in a strong oxidizing flame changes to the red oxide, Fe_2O_3, with loss of magnetism. Magnetite is found in many igneous rocks, in which it represents one of the earlier products of crystallization, and, in such, magmatic segregation (see ORE DEPOSITS) may concentrate the magnetite into workable deposits. Magnetite is also found in metamorphic rocks, in which it represents the product of either regional or contact-metamorphism. Some sedimentary rocks also contain it. The value of magnetite as an ore of iron depends in part on the percentage of sulphur, phosphorus, and titanium which the ore contains, and in part on siliceous mineral impurities, but the latter can be eliminated by magnetic separation. See ORE DRESSING.

Magnetite deposits may serve as important sources of iron. In the United States it is known to occur along the Appalachians, especially in the Adirondacks, in the Highlands of New York and New Jersey, at South Mountain, Pa., and in Virginia and North Carolina. Only the first-named is of great commercial importance. It is usually associated with pre-Cambrian gneisses. Deposits of magnetite are also known in Minnesota, Missouri, Colorado, Utah, California, and in foreign countries. The deposits of Kirunavaara and Gellivare in Sweden are the largest known deposits in the world. The production of magnetite in the United States in 1913 was 2,375,274 long tons. Consult: H. Ries, *Economic Geology* (3d ed., New York, 1910); Waldemar Lindgren, *Mineral Deposits* (ib., 1913); Singewald, *Titaniferous Iron Ores* (Washington, 1913). See IRON.

MAGNETO, măg′nĕt-ō *or* măg-nē′tō, IN MOTOR VEHICLE. See MOTOR VEHICLE.

MAGNETO-ELECTRIC MACHINE. A machine for generating electricity by rotating a coil of wire in the field of a permanent magnet, usually of the horseshoe type. The rotating coil is commonly wound on a soft-iron core to increase the density of the magnetic field. The fundamental principle on which the machine operates will be found described under DYNAMO-ELECTRIC MACHINERY. Magneto machines are used for a variety of purposes where it is desirable to use alternating currents. For blasting operations such a generator is arranged with a rack and pinion attached to the armature, which, when rapidly rotated, develops a current which, conducted through insulated wires, heats a platinum wire and explodes the charge by means of a fulminate cap. Telephone circuits not operated on the "common battery" system usually employ magneto generators for ringing. (See TELEPHONE.) One of the largest fields of use of the magneto is that of furnishing ignition currents for gas and oil engines of small and medium sizes. For automobile-engine ignition the generator is driven by gears from the main shaft of the motor, and for motor-boat installations by gears, chain and sprocket, or by frictional contact with the flywheel. (See INTERNAL-COMBUSTION ENGINE; MOTOR VEHICLE.) To a limited extent magnetos are employed for medical purposes, to generate small alternating currents in connection with an induction or shocking coil, the inductance of which can be varied. Such magnetos are now largely superseded by other sources of alternating or pulsatory current.

MAGNE′TOGRAPH (from Gk. *μάγνης, magnēs,* magnet + *γράφειν, graphein,* write). An instrument so constructed as to record, generally by photographic means, the variations or fluctuations to which the earth's magnetism is continually subject. The action of such an instrument is shown by the accompanying sketch. Such instruments, as generally arranged, give a continuous record of the changes in the magnetic declination and in the strength of the



RECORDING MAGNETOMETER (MAGNETOGRAPH).

The light from the lamp, shining through the small opening *O* upon the lens *C*, is brought to an image of *O* upon the sensitive paper on the drum *D*, after being reflected from the magnetometer mirror *M*. Any angular motion of *M* around a vertical axis causes the image to move with reference to *A* and *B*. This motion, combined with that of the drum *D* as it is revolved by clockwork, gives a broken line as the record of the magnetic fluctuations.

horizontal and of the vertical components of the earth's magnetic field. They will be found in use at magnetic observatories. See MAGNETOMETER; TERRESTRIAL MAGNETISM.

MAG′NETOM′ETER (from Gk. μάγνης, *magnēs*, magnet + μέτρον, *metron*, measure). An instrument for measuring the strength of a magnetic field, more specifically of the earth's magnetic field, in which case the instrument is also generally capable of measuring the magnetic declination, or inclination, or both, according to mode of construction. It may be a simple small magnetic needle supported upon a point and swinging over a divided circle, or it may be a magnetized bar hanging upon a fibre of silk or quartz or other material, and the deflections read with a mirror on the magnet and using a telescope and scale or a reflected beam of light In a simple magnetometer the magnet hangs in a small house or box of wood or copper and the attached mirror is visible through a little window. The magnet and mirror are suspended upon the silk or quartz fibre, or phosphor-bronze ribbon, hanging in the tube above the magnet house. Fig. 1 shows an early form of the "tangent" magnetometer with the attached bar for supporting the deflecting magnet, which is placed at a definite distance from the suspended or deflected magnet, and with its axis pointing at right angles to the compass direction or magnetic meridian.

A magnetometer set up with its magnet in the magnetic meridian will show the declination (q.v.) and its variations; i.e., the angle may be found between the magnetic north as shown by the magnet and the true north as determined by astronomical observations. By observing the time required for a complete vibration of the suspended magnet a measure of the relative strength of the earth's magnetic field is obtained. From a combination of vibration and deflection observations the absolute strength of the field is found. When the magnet is supported, e.g., on two fibres, as in Fig. 2, then the instrument is so set up that the bifilar suspension holds the magnet at right angles to the magnetic meridian. In this position this magnetometer measures the strength of the horizontal component of the earth's magnetic field.

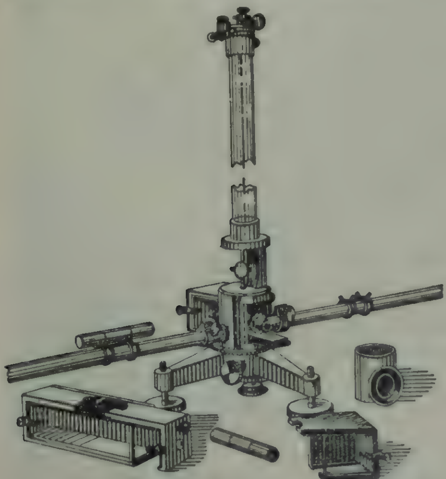


FIG. 1. GAUSS-WEBER TANGENT MAGNETOMETER.

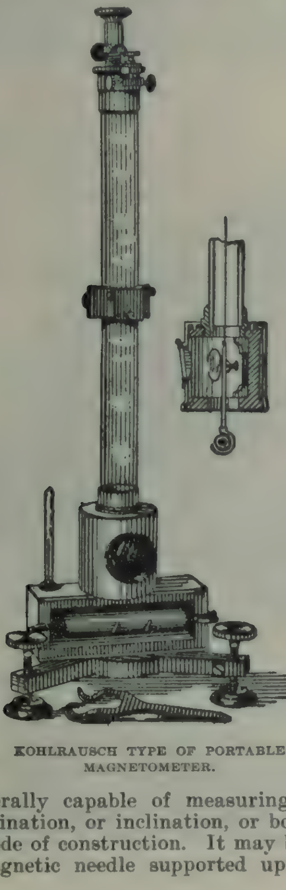


FIG. 2. KOHLRAUSCH TYPE OF PORTABLE BIFILAR MAGNETOMETER.

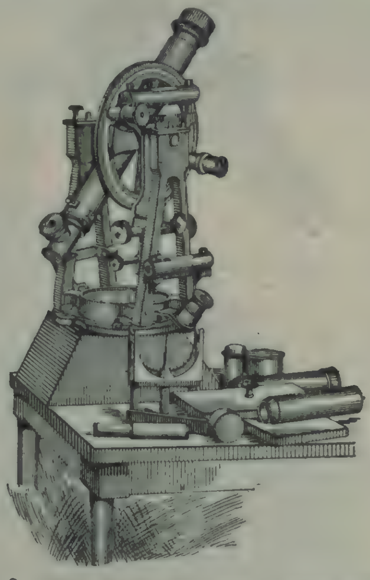


FIG. 3. THEODOLITE FOR MAGNETIC OBSERVATIONS.

Figs. 3 and 4 show a theodolite used for the determination of the astronomical meridian, or true north, at a certain given station, and a standard form of "sine" magnetometer. Here the astronomical meridian is determined with the theodolite, which is then replaced on the mounting by the magnetometer. The chief difference between this form of magnetometer and that shown by Fig. 1 is that here during deflection observations the axis of the deflecting magnet is always supposed to be at right angles to that of the deflected magnet. The reader can find full descriptions of magnetometers in the bulletins of the Division of Terrestrial Magnetism of the United States Coast and Geodetic Survey and in the issues of *Terrestrial Magnetism* (Baltimore, current). The older forms of magnetic instruments will be found described in the larger treatises on physics, while the simple apparatus is discussed briefly in Thompson, *Elementary Lessons in Electricity and Magnetism* (see latest ed., New York). Brief references to the newest types of magnetic instruments as devised by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, for use in magnetic surveys on land and at sea, will be found in the article Terrestrial Magnetism. See also Declinometer; Dip Circle; Magnetograph.

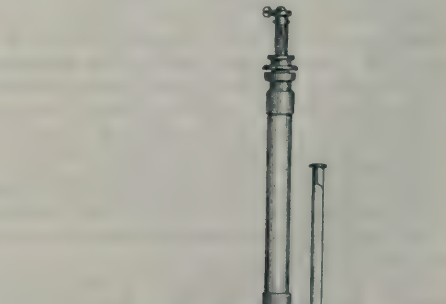


FIG. 4. UNITED STATES COAST AND GEODETIC SURVEY PORTABLE SINE MAGNETOMETER.

MAGNIF'ICAT (Lat. *Magnificat anima mea Dominum,* My soul doth magnify the Lord). The song of thanksgiving ascribed to the Virgin Mary (see Luke i. 46–55), and later incorporated into the service of vespers, in which it forms the principal part, corresponding to the other "evangelical canticle," the *Benedictus,* at lauds. At solemn vespers, during the singing of the *Magnificat,* the altar is censed by the officiant, vested in a cope. The English version was incorporated in the Anglican prayer book, to be sung or said after the first lesson at evening prayer. It was omitted in the American prayer book, but restored at the revision.

MAG'NITUDE (Lat. *magnitudo,* from *magnus,* great), Perception of. Size or magnitude, psychologically regarded, is a quantitative determination of extension. For its perception, see Extension, and the perceptions of Form, Distance or Depth, Locality, and Movement.

MAGNO'LIA. A city and the county seat of Columbia Co., Ark., 150 miles southwest of Little Rock, on the St. Louis Southwestern Railroad, and the terminus of the Louisiana and Northwest Railroad (Map: Arkansas, B 4). It is the centre of a fertile region, having valuable timber lands, and carries on a trade in cotton, cottonseed products, potatoes, oats, corn, fruit, and lumber, its commercial interests being of considerable importance. A State agricultural college is situated here. Pop., 1900, 1614; 1910, 2045.

MAGNOLIA (Neo-Lat., named in honor of Pierre Magnol, a French botanist of the early seventeenth century). A genus of large-leaved beautiful trees of the family Magnoliaceæ, with large solitary flowers, having a calyx of three sepals, a corolla of six to 12 petals, and carpels arranged in cones. The species are natives chiefly of North America, the Himalaya Mountains, China, and Japan. The wood is in general soft, spongy, and of little value. *Magnolia fœtida,* or *Magnolia grandiflora,* sometimes called the big laurel, is a lofty and magnificent evergreen, rendered conspicuous at a great distance by its white flowers nearly a foot in diameter. It is found in the coastal plain from North Carolina to central Florida and Louisiana, where it is conspicuous in the forests. *Magnolia tripetala* is found on the Alleghany Mountains, and extends as far north as lat. 43°. From the radiated manner in which its leaves are disposed at the extremities of the branches it is called umbrella tree. It has very large white flowers. *Magnolia acuminata,* cucumber tree, inhabits the same districts, and is a lofty tree with greenish-yellow flowers, which are less admired than those of other species. *Magnolia virginiana,* white bay, beaverwood, swamp sassafras, a native of Pennsylvania, Virginia, and Carolina, is a tree or shrub of three to 75 feet in height, with beautiful fragrant white flowers. The yulan, or Chinese magnolia (*Magnolia yulan*), has been much cultivated in China for more than 1200 years, for its profuse, beautiful, fragrant white flowers, which appear before the deciduous leaves. It is one of the finest of ornamental trees, and

MAGNOLIA VIRGINIANA.

MAGNOLIA AND MANGROVE

1. MAGNOLIA (Magnolia Soulangiana).   2. MANGROVE (Rhizophora Mangle).

succeeds in most of the United States from New York southward. It is followed in time of flowering by *Magnolia soulangeana* and *Magnolia obovata*, a Japanese species with purplish tinted flowers. *Magnolia macrophylla* and *Magnolia fraseri*, American species, have about the same range as *Magnolia fœtida*, are trees 40 to 50 feet in height, and are conspicuous for the size of their leaves, which in *Magnolia macrophylla* become from 1 foot to 3 feet long and a foot across. The flowers are white with a purple spot at base, the petals 3 to 6 inches long. The genus *Magnolia* appears first in the Cretaceous rocks of Europe, and its fruits and leaves are abundant in the succeeding Tertiary deposits of North America, Europe, Asia, and Australia, and also in the Arctic regions far outside the limits of its present distribution. Consult W. E. Maneval, *Development of Magnolia and Liriodendron* (Baltimore, 1914).

MAG′NUS. The name of several kings of Norway, Denmark, or Sweden.—Magnus I (Olafsson) the Good, King of Norway (1035–47) and of Denmark (1042–47), was a son of St. Olaf (q.v.).—Magnus Haraldsson, son of Harald Haardraade, was King of Norway (1066–69).—Magnus II the Barefooted, King of Norway (1093–1103), conquered the Orkneys and Hebrides, and was killed in an expedition to Ireland.—Magnus the Blind was King of Norway (1130–35).—Magnus Erlingsson, King of Norway (1161–84), was the first King to be crowned in Scandinavia.—Magnus Lagaböter, King of Norway (1263–80), was the great reformer of the laws of Norway, Iceland, the Faroe Islands, and Greenland.—Magnus Ladulås, King of Sweden (1275–90), was a just ruler, who protected the people against the powerful nobles.—Magnus Eriksson was King of Norway (1319–55) and of Sweden (1319–64). He gave Norway to his three-year-old son Haakon in 1343. He reigned in Sweden until 1364, when he was deposed by his subjects, who gave the crown to Albert of Mecklenburg. Magnus was drowned in 1374.

MAGNUS, Heinrich Gustav (1802–70). A German physicist and chemist, born at Berlin. He studied at Berlin and under Berzelius at Stockholm. At the age of 26 he had already made important contributions to chemistry, and in 1834 was made extraordinary, and in 1845 full, professor of physics and technology in the University of Berlin. His original investigations include important experiments on the transmission of heat through gases, a series of determinations of the vapor pressures of water at different temperatures, and of the vapor pressures of homogeneous liquid mixtures, etc. Consult Hofmann, *Zur Erinnerung an Gustav Magnus* (Berlin, 1871).

MAGNUS, Olaus (1490–1558). A Swedish historian and cartographer, born at Linköping. Following the lead of his elder brother, the Archbishop of Upsala, he entered the Church, and was an archdeacon by 1523. On the success of the Reformation in Sweden both brothers went to live in Rome, and upon the death of the Archbishop (1544) Olaus became his titular successor. Two years afterward Paul III sent him to the Council of Trent. His *Historia de Gentibus Septentrionalibus* (22 vols., Rome, 1555; numerous editions in Latin, Italian, French, German, Dutch, English, and Swedish) is a valuable description of the customs and mode of living of the contemporaneous people of the North, their animals and plants. His large map of Scandinavia (Venice, 1539) is a work of great merit. Consult O. Brenner, *Die echte Karte des O. Magnus vom Jahre 1539* (Christiania, 1886).

MAGNUS, Sir Philip (1842–). An English educator. He was born in London and was educated at University College, London. He organized the City and Guilds of London Institute and was its secretary in 1880–88. For his work in general education and particularly in technical education—he was member of the royal commission on that subject in 1881–84—he was knighted in 1886. In 1906 he was elected member of Parliament for London University. In 1907 he was president of the education section of the British Association. He wrote *Industrial Education* (1888) and textbooks of mechanics.

MAGNUS HITCH. See Knotting and Splicing.

MAGNÚSSON, mȧg′nōōs-sôn, Arni (1663–1730). A Norse scholar and antiquary, born in Iceland, a descendant of Snorri Sturluson. After studying at home Magnússon went to Copenhagen, where he soon after received an appointment in the Royal Archives. In 1701 he became professor of philosophy and northern antiquities at the university. From 1702 till 1712 he traveled through Iceland as a member of a commission that gathered old manuscripts, and at this time laid the foundation of the famous collection that bears his name, *Den Arnamagnœanske Haandskriftsamling*, which contains over 15,000 old manuscripts and books from Iceland, Norway, and Denmark. It is largely owing to Magnússon's industry and enthusiasm that so much of the classical literature of Iceland has been preserved. After returning to Denmark he continued to add to his collection. In 1728 a part of his collection was destroyed by fire. The remaining portion, together with Magnússon's whole fortune, was bequeathed to the university library, where it is now lodged. A complete catalogue of the collection, with a biography of Magnússon and other related matter, was published by Dr. Kr. Kaalund (2 vols., Copenhagen, 1888–94).

MAGNÚSSON, Eiríkr (1833–1913). An Icelandic scholar. He was born at Berufjördur, Iceland; was educated in theology at the Latin School of Reykjavik; and in 1862–66 edited a revised edition of the Icelandic Bible. From 1871 to 1910 he was underlibrarian at Cambridge University, where he lectured also on Iceland. He did much to promote the study of Old Norse literature, in which he was a scholar of the first rank. In 1893 he was awarded a gold medal by the Société des Inventeurs, Paris, for the plan of a library building which could be extended indefinitely. He translated from Icelandic many sagas and six stories under the title *Three Northern Love Stories and Other Tales* (1875).

MAGNÚSSON, Finnur (Magnusen, Finn) (1781–1847). A Norse scholar and archæologist. He was born Aug. 27, 1781, at Skálholt in Iceland. He practiced law, but his strong bent towards archæological pursuits led him in 1812 to return to Copenhagen, where he devoted himself with much zeal to his favorite studies, under the direction of his distinguished countrymen Thorkelin and Thorlacius. In 1815 he obtained a chair of literature in the university. Among his earliest and most noteworthy works are his papers on the aboriginal home and earliest migrations of the Caucasian races (1818); his contributions to northern archæology (1820); the indexes, glossaries, and lexicon which he compiled for the elucidation of the second and third of the Arni Magnússon editions of the Eddas (1818 and 1828); his comprehensive translation of the Elder Edda, *Ældre Edda, oversat og forklaret* (1824); and his exposition of the same work (*Eddalæren og dens Oprindelse*, 1824–26). Among his later works, his *Runamo og Runerne* (1841) has given rise to much angry discussion; and although many of his interpretations of assumed runes have been proved to be untenable, the learning and acumen which he brought to bear on the subject of runes generally have thrown great light on this branch of archæology. In conjunction with Rafn, Magnússon elucidated the history and antiquities of Greenland in an able work (*Grönlands historiske Mindesmærker*, 3 vols., 1838–45), his best work; and he subsequently prosecuted a similar course of inquiry in regard to Russia in *Antiquités russes* (1850–52). In addition to these works, Magnússon annotated many of the most important remains of old northern literature, as the *Heimskringla, Hákonarmál, Laxdæla-Saga*, etc.; and besides numerous monographs on archæological and historic subjects of interest, made many valuable contributions to current Icelandic literature. He died Dec. 24, 1847.

MA′GO (Lat., from Gk. *Μάγων, Magōn*). A name common in Carthaginian history. 1. The most famous of those who bore it was Mago, the son of Hamilcar Barca, and younger brother of Hannibal. He participated in the invasion of Italy. After the battle of Cannæ, under orders from the government at Carthage, he opposed the Roman armies in Spain for many years. In 207 he was defeated by Scipio Africanus Maior, at Silpia. In 206 B.C. he crossed over into Liguria in Italy, but was defeated in a battle there by the Romans (see CETHEGUS, 1), and on the way home died of his wounds (203 B.C.). Consult: Konrad Lehmann, *Der Angriff der drei Barkiden auf Italien* (Leipzig, 1905); Otto Meltzer, *Geschichte der Carthager*, vol. iii (Berlin, 1913). 2. The reputed author of a famous work on agriculture, which was brought to Rome, by order of the Senate, after the destruction of Carthage, and translated into Latin. 3. The name was borne also by a Carthaginian who was famous as organizer, especially of the Carthaginian army, who flourished about 550–500 B.C.

MAGOF′FIN, BERIAH (1815–85). An American politician, born in Harrodsburg, Ky. He graduated at Centre College, Danville, Ky., in 1835, and at the law school of Transylvania University in 1838, after which he began to practice at Jackson, Miss. In 1859 he was elected Governor for a four years' term. He was a strong advocate of the "Crittenden compromise." He refused to pay any attention to Lincoln's first call for troops, and followed his refusal by proclamations prohibiting recruiting in Kentucky for either Federal or Confederate armies. In the spring of 1862 the State Legislature passed a resolution over his veto asking him to issue a proclamation against the entrance into the State of Confederate troops. He complied, but in the following August, recognizing that his position was untenable and his power gone, he called the Legislature in special session and resigned. He was a member of the State Legislature for several terms after the war.

MA′GOG. See GOG AND MAGOG.

MAGOG. A town of Stanstead Co., Quebec, Canada, at the outlet of the river of the same name from the north end of Lake Memphremagog, 19 miles southwest of Sherbrooke (Map: Quebec, F 5). It is a favorite angling resort, has daily steamer communication with Vermont, and is a station on the Canadian Pacific Railway. Its manufactures include lumber, butter and cheese, and textile prints. Pop., 1901, 3516; 1911, 3978.

MAGOON, ma-gōōn′, CHARLES E. (1861–1920). An American lawyer and administrator, born in Steele Co., Minn., and educated at the University of Nebraska. He was admitted to the bar in 1882, became judge advocate of the Nebraska National Guard, was law officer of the Bureau of Insular Affairs, War Department, in 1899–1904, general counsel of the Isthmian Canal Commission for a year, and a member of the commission (1905–06). From May 25, 1905, to Oct. 12, 1906, he was governor of the Canal Zone, and during most of this period was also Minister to Panama. During the military occupation and intervention of the United States in Cuba from 1906 to 1909, consequent upon the revolution in the island, Magoon was governor representing the War Department. In this capacity he maintained order, fostered prosperity, and introduced many beneficial reforms in finances and sanitation. He published *The Law of Civil Government under Military Occupation* (1902).

MAGOT, măg′ot *or* mȧ′gō′. The Barbary ape. See MACAQUE.

MAGPIE (variant of *magotpie*, from *Mag, Magot*, abbreviation of *Margaret* + *pie*, OF., Fr. *pie*, from Lat. *pica*, magpie, either from *pingere*, to paint, in allusion to its spotted hue, or connected with *spicere*, to spy, and ultimately with provincial Eng. *speight*, woodpecker). Somewhat intermediate between jays and crows and closely related to both is the genus *Pica*, the species of which are known, wherever English is spoken, as magpies. In size and coloration magpies resemble small crows, while in many other respects they are more like the jays. Their most prominent external character is the long, graduated tail, which is sometimes longer than head and body together, and the outer feathers of which are scarcely half the length of the middle pair. The best-known species of the genus is the common magpie of Europe (*Pica pica*), of which a very closely allied form, known as the black-billed magpie (*Hudsonia*), is abundant in western North America, except California, ranging as far east as Manitoba and Minnesota, and northward to the North Saskatchewan River. (See Plate of JAYS, MAGPIES, ETC.) This bird is rather more than 15 inches long and about 2 feet across the extended wings. The color is lustrous black, with green, violet, and purple, sometimes even golden, iridescence. The lower parts, a patch on each shoulder, and portions of the wings are white. The bill and feet are black. A very similar species (*Pica nuttalli*) is found in California, but is easily distinguished by the bright yellow bill and naked space about the eye. Magpies generally go in pairs and are remarkable for their slyness and cunning in escaping observation. When in small flocks, they are bolder and more noisy. The cry is loud, harsh, and unmusical, but when the bird is alone it is usually silent. It is very clever in hunting and securing its food, which consists of almost anything eatable, though, like the jays, it is especially fond of eggs and young birds. On this account magpies are constantly hunted and killed by gamekeepers; but in many places these birds are encouraged to come about houses because of their bright, saucy habits and handsome plumage.

The nest of the magpie is a most remarkable structure, nearly as large as a bushel basket, placed in thick shrubbery. The top and outside are made up of interwoven thorny branches, within which is the nest proper, composed of earth and lined with fibres and grass. There is an opening on each side, so that the long tail rests in the one at which the bird enters, while it can when necessary escape at the other without turning. The eggs are from five to nine in number, pale drab, dotted, dashed, and blotched with purplish brown. The magpie is easily tamed and soon becomes very familiar and may sometimes be taught to articulate a few words, but, like the crow, it is a troublesome pet, for it is a sneak thief of the same stamp. In the Old World the common magpie occurs in Siberia as well as in most parts of Europe, and there are several other Asiatic members of the genus. The so-called blue magpies are natives of the Old World and belong to the genus *Cyanopolius*, but they are quite as much jays as magpies. There are only two species, which are very similar, though one is confined to the Spanish peninsula, while the other occurs in eastern Asia and Japan. The name blue magpie is also given sometimes to the very long-tailed jays of the genera *Calocitta* and *Urocissa*, the former a Central American, the latter an Oriental group. Various birds of pied plumage not magpies at all are sometimes called so, as the mottled owl, a magpie robin, magpie shrike, etc.

Consult: Elliott Coues, *Birds of the Northwest* (Washington, 1874) and the authorities there cited; L. S. Keyser, *Birds of the Rockies* (Chicago, 1902); Dawson and Bowles, *The Birds of Washington* (Seattle, 1909).

MAGRATH, mȧ-grăth′, William (1838–). An Irish-American landscape and figure painter, born in Cork. He studied in his native city before coming to the United States in 1855. Afterward he practiced in London, in New York City, where he was elected a National Academician in 1876, and in Washington. His best work is in character studies, such as "The Road to Kenmair" (1871); "The Reveille" (1873); "Rustic Courtship" (1877); "On the Old Sod" (1879), in the Metropolitan Museum of Art, New York; "Paddy on his own Land" (1900); "Sheep Pasture" (1903); "The Killarney Country" (1910); "The Bog of Allen, Ireland" (1911); "Bog Lands" (1913).

MAGRU′DER, John Bankhead (1810–71). An American soldier, born at Winchester, Va. He graduated at West Point in 1830 and was assigned to the Seventh Infantry, but was transferred the next year to the artillery. He served at various Eastern garrisons, became first lieutenant in 1836, took part in the Florida War of 1837–38 and in the military occupation of Texas in 1845–46, and in 1846 was promoted to be a captain. During the Mexican War he was brevetted major (April, 1847) and lieutenant colonel (September, 1847) for gallantry at Cerro Gordo and Chapultepec respectively. He was in garrison in Washington in 1861, and resigned from the national service to become colonel in the Confederate army. His first command was that of the artillery around Richmond. After winning the battle of Big Bethel he was promoted to be brigadier general in June and became major general in October. While in command of the district of Yorktown he prepared the fortifications across the peninsula of Yorktown, and with 12,000 men defended a line 13 miles long against McClellan's entire army during the month of April, 1862. In the Seven Days' Battles he commanded the Confederate left wing and attacked at Savage's Station and Malvern Hill. He was then appointed to the new Trans-Mississippi Department, but this command was reduced to Texas alone. On Jan. 1, 1863, he recaptured Galveston, drove off the blockading squadron, and succeeded in keeping the port open. New Mexico and Arizona were added to his department. At the close of the war he joined the army of Maximilian in Mexico as major general and served until the Empire fell. For a time he lectured on his experiences in Mexico, but settled at Houston, Texas, in 1869.

MAGUAQUE, Rodrigo Cota de. See Cota de Maguaque, Rodrigo.

MAGUEY, măg′wā; *Sp. pron.* mȧ-gā′ė. Various agaves and their fibre, more properly restricted to *Agave cantala*, the Mȧnila maguey. See Agave.

MAGUIRE, mȧ-gwīr′, John Francis (1815–72). An Irish lawyer and journalist. He was called to the bar in 1843, edited and published at Cork the Roman Catholic *Examiner*, sat in Parliament as member for Dungarvan from 1852 to 1865 and for Cork from 1865 till his death. He was a supporter of Home Rule, and was for several years mayor of Cork. He was the author of *The Industrial Movement in Ireland* (1852); *Rome and Its Ruler* (1857; enlarged as *The Pontificate of Pius IX*, 1870); *Father Mathew: A Biography* (1863); *The Irish in America* (1868); *The Next Generation* (1871).

MAG′UNTI′ACUM. See Mainz.

MAGUS, Simon. See Simon Magus.

MAGYAR, mŏ′dyŏr, László (1817–64). An Hungarian traveler, born at Maria-Theresiopel (Szabadka). He was in the Austrian navy for two years and from 1844 to 1847 traveled in the United States, the West Indies, and South America, where he fought with Argentina against Uruguay. Subsequently he visited the Portuguese colonies of South Africa, journeying thence by caravan into the centre of the continent as far as Bihe, where he married a native princess and remained to make important explorations into the surrounding unknown country. In 1857 he left for Luiera Bay to establish a post between Benguela and Mossamedes for the Portuguese government. The results of his travels were published at Budapest (1859) under the title, *Travels in South Africa in 1849–57*.

MAGYAR LANGUAGE. See Hungarian Language.

MAGYAR (Gypsy, or Hungarian) **MUSIC**. The characteristic music of Hungary, in which the Magyar and Gypsy elements in the population find expression. The following characteristic scale is undoubtedly of Asiatic origin: C, D, E♭, F♯, G, A♭, B, C. The distinctive features of Magyar music are endless variety of rhythm, absolute freedom, even abruptness, in modulation, and a profusion of embellishments. Polyphony is practically unknown, the performances consisting chiefly of improvisations upon well-known melodies, although original themes are also employed. The national instrument is the violin. The Magyar orchestra was formerly composed of various instruments, the violin and the cembalo being the principal ones. This cembalo is an oblong box with steel strings struck by two wooden mallets. To-day there are also second violins, celli, double basses, clarinets, and trumpets. These, however, are not used as in our music, but only for the doubling of the harmonies and the accentuation of the rhythm. The principal instrument always remains the violin, and all others follow it. It is almost impossible for us to conceive how so many performers can keep together when the principal instrument practically improvises. But competent musicians who have heard the Magyar orchestra are unanimous in their admiration of the precision and fire with which everything is executed. Even as early as the thirteenth century the musicians of Hungary were famous. During the fourteenth century their assistance was considered indispensable in the celebration of all public festivals. It is on record that about 1550 Karmann reaped honors and wealth through his marvelous performance upon the violin. Michael Barum is called the Hungarian Orpheus. He won the first prize at a tournament arranged by the magnates of Hungary. About 1775 Cinska Pama was regarded as the greatest violinist. The more recent of the great Magyar violinists, who also appeared in Germany, were Paticarius, Kecskeméty, Sarközy, and Bihary.

That practically nothing has been preserved of their compositions is due to the fact that they were chiefly improvisations. The peculiar embellishments, the sudden transitions, and ever-changing and complicated rhythms make actual notation exceedingly difficult. Nevertheless, the written works of Lavotta and Czermak give a good idea of the genuine Magyar music. The latter is regarded by the Hungarians as their greatest national composer, although by birth he was a Bohemian.

The musical forms of the Hungarians are very limited. The artists give themselves up to momentary inspirations. Hence the chief form would be the fantasia, which, in reality, is no form at all. The only definite artistic form we find in the national dance, the csárdás (q.v.). Some of our great masters have been strongly influenced by the Magyar music, as Haydn, Schubert, Joachim, Brahms, and particularly Liszt, whose 15 Hungarian rhapsodies are masterly arrangements of genuine Hungarian melodies. The great pianist has also written a book, *Des Bohémiens et de leur musique en Hongrie* (Paris, 1859), translated into German by P. Cornelius, *Die Zigeuner und ihre Musik in Ungarn* (Budapest, 1861). Consult also the Appendix to Ludwig Nohl's *Allgemeine Musikgeschichte* (Leipzig, 1884), and D. C. Parker, *Some Aspects of Gypsy Music* (New York, 1913).

MAGYARS. See HUNGARY.

MAHABHARATA, mȧ-hä'b'hä'rȧ-tȧ (Skt. *mahā*, great + *bhārata*, war or story of the Bharatas). The great epic of India, nearly eight times as long as the *Iliad* and *Odyssey* combined. Native Hindu tradition interprets its title as referring either to the great war waged by the Bharatas or to the poem itself which recounts the war. The latter is probably a later view, based on the complete epic as it has come down to us in 18 books, containing altogether about 100,000 stanzas. Of these, some 5000 are in four-verse form of 11 syllables each (4 × 11), and the remainder, with the exception of about 200 stanzas of more elaborate construction, in stanzas of 30 syllables. There are also short passages in prose. An improbable tradition represents this poem as having been originally much longer. More in accord with historic possibility is another tradition pointing to the fact that the Bharata poem was at first only a quarter of its present length, the poem itself being distinguished from the numerous episodes now included in it. The predicate *Mahā* ('great') would thus distinguish the redaction containing these episodes from one without them. A supplementary book on the genealogy of Vishnu, the *Harivanśa* (q.v.), is a still later addition. Like many other Hindu works, the Mahabharata is supposed to have been composed by Vyāsa; but in reality it bears the marks of having been compiled by numerous revisers working over the material of the old rhapsodists and uniting this with the lucubrations of sectarian religious philosophers. The kernel of this work is an epic narrative telling how the ancient family of the Kurus (Kauravas) was overthrown, in consequence of their own wickedness, by the opposed Panchalas and Pandus (Pandavas). The last named are the real heroes of the epic, which lauds them as faithful worshipers of the true god Krishna, the human incarnation of Vishnu (q.v.). After the genealogy of the families has been narrated in the first book, the epic action begins with an account of a gambling match, at which the Kurus unfairly cheated the Pandus (reported to be their cousins), robbed them of their neighboring kingdom, and exiled them for 12 years. The story of the exile in the woods gives opportunity for many tales, told to while away the tedium of the banishment. The most famous episodes are those of Nala and Damayanti and of Savitri. On the expiration of the exile period the opposing forces, having collected their allies, meet on the sacred Plain of the Kurus, and the great war (or 18 days' battle) takes place, resulting in the overthrow of the Kurus. Though the epic properly ends here, it is prolonged, by means of philosophical and ethical discussions embracing the most minute points of social and moral observance, for 20,000 stanzas, which have nothing to do with the story itself and are in fact merely a popular exposition and summary of legal and philosophic lore. These huge additions make of the epic an encyclopædia of all knowledge with a strong bias towards religious proselytism. As compared with the Ramayana (q.v.) (the second great epic of India), the Mahabharata is mentioned earlier in Hindu literature and the scene is laid in the older seat of Brahmanic learning, at Kurukshetra and Hastinapura (q.v.), near the modern Delhi. It is probably in origin the older of the two epics, though dating in its present form from a later period than the time when the Ramayana was composed. Some sort of a Bharata war story was probably handed down from remote antiquity in constantly changing poetic form; but the usurpation of the heroes' place by the newer house of the Pandus shows that our present version cannot be of very great antiquity, and it is likely that some of the episodes are really older than the main poem in its modern shape. The present poem appears to have been composed about 200 B.C., with extensive additions from time to time, till about 100 A.D., when it was probably almost in the condition now preserved to us, as was certainly the case 300 or 400 years later. Many later Puranas (see PURANA) are based on the story of this epic and are virtually sectarian tracts in honor of Vishnu or Siva, the two gods whose unity is proclaimed by the epic. Later classical literature also draws largely from the same source. Holtzmann's opinion that the epic dates from the Middle Ages is now given up by all scholars. Of late Dahlmann has contended that the epic was composed all at one time, perhaps even by one person, about 500 B.C. In this extreme form Dahlmann's views have proved unacceptable; though he has shown that it is not possible to reject offhand this or that portion as a later addition, and has thus put the finishing touch to the demolition of Holtzmann's theory of the construction of the poem. The composite character of the poem as shown by metre and contents has been strongly brought out by Hopkins, who argues against the extremist opinions of Dahlmann as regards both the date of the poem and its unity of composition. It is an open question whether in its earliest beginnings the Bharata poem did not record events of far greater historical importance than those now chronicled in it. Grierson holds that it originally described a conflict for the controlling power in all Northern India as waged by the earliest Aryan immigrants against those who came into the country at a later date. While it would be difficult to find support for this hypothesis in the poem itself, it is at least a reasonable theory. On the other hand, quite unsupported by any sound interpretation of history is the use made of supposed epic data by Hewitt in his recent Akkadian studies. Apart from the question of the date of the poem and of the war as now described in it, lies the question of the date of the original Bharata war, which may reasonably be referred to about the twelfth century B.C. According to Aiyer, B.C. 1194 is the date of the Kuru-Pandu battle, but this view, though ingeniously supported, ignores the fact that the Pandus were unknown at that early age. The prose portions of the epic seem to be based on an earlier work, the *Itihāsa-Purāṇa*, which purported to be an elucidation and supplement of the Vedic Itihāsa hymns (Skt. *Iti ha āsa*, Thus it was) and therefore constituted the link between the Veda and the epic.

The text of the Mahabharata in its Northern recension has been published in Calcutta in four quarto volumes (1834–39), to which is added a table of contents. A better edition is published in Bombay (1863) in six volumes, with one recently added containing the Harivanśa. It is stereotyped and has been reprinted several times (with the Harivanśa in 1900), and has besides the text the commentary of Nilakantha. An edition based on the Southern recension was published at Madras (1855–60) in four volumes. Extracts from the Southern version of the text (not radically different from the Northern) have been given by Winternitz (*Indian Antiquary*, vol. xxvii). English translations have been made by Mohan Ganguli (Calcutta, 1883–96) and M. N. Dutti (ib., 1895–1905). A new edition was begun at Calcutta in 1904 by Tarkaratna, and there is a French translation by Fauche and Ballin (Paris, 1870–99), which is neither complete nor accurate. Various episodes of the epic have been translated by Holtzmann, *Indische Sagen* (Stuttgart, 1854), and by Edwin Arnold, *Indian Idylls* (Boston, 1883). See also E. W. Hopkins, *India, Old and New* (New York, 1901). Summaries of the poem are furnished by Williams, *Indian Wisdom* (London, 1876); Romesh Dutt, *Mahabharata, the Epic of Ancient India, Condensed into English Verse* (ib., 1898); J. C. Oman, *The Great Indian Epics* (ib., 1899). For a study of the epic in connection with the Sanskrit literature, consult Moritz Winternitz, *Geschichte der indischen Literatur* (Leipzig, 1908 et seq.). Technical works are: Adolf Holtzmann, *Das Mahābhārata* (Kiel, 1892–95); J. G. Bühler, *Indian Studies* (Vienna, 1892); Joseph Dahlmann, *Das Mahābhārata als Epos und Rechtsbuch* (Berlin, 1895); id., *Genesis des Mahābhārata* (ib., 1899); E. W. Hopkins, *The Great Epic of India: Its Character and Origin* (New York, 1901); Aiyer, *The Chronology of Ancient India, First Series, Date of the Mahābhārata War* (Madras, 1901); Hermann Jacobi, *Mahabharata* (Bonn, 1903); and Sorensen, *Index to the Mahabharata* (London, 1904–14). For the philosophical ideas of the epic, consult: Garbe, *Die Bhagavatgîtâ* (Leipzig, 1905); Deussen and Strauss, *Vier Philosophische Texte aus dem Mahâbhâratam* (ib., 1906); Bhandarkar, *Vaisnavism, Saivism* (Strassburg, 1913).

MAHADEVA, ma-hä-dā'vȧ. See RUDRA.

MAHADEVI, ma-hä-dā'vē. See DEVI.

MAHAFFY, JOHN PENTLAND (1839–1919). An eminent British classical scholar and historian, born at Chaponnaire, on Lake Geneva, Switzerland. He received his early education in Germany, then entered Trinity College, Dublin, where he graduated in 1859. After 1871 for many years he was professor of ancient history in the University of Dublin. He received honorary degrees from the universities of Dublin, Louvain, St. Andrews, Oxford, and Athens; was made honorary fellow of Queen's College, Oxford, and became senior fellow of Trinity College, Dublin; was decorated with various orders; was elected honorary member of many foreign learned societies; and in 1911 served as president of the Royal Irish Academy. His most important works deal with the history of ancient Greek civilization. Among his publications are the following: *A Translation of Kuno Fischer's Commentary to Kant's Critique* (1866); *Twelve Lectures on Primitive Civilization* (1868); *Prolegomena to Ancient History* (1871); *Social Life in Greece from Homer to Menander* (3d ed., 1877); *Rambles and Studies in Greece* (7th ed., 1913); *A History of Classical Greek Literature* (2d ed., 1892); *The Story of Alexander's Empire* (1886); *The Greek World under Roman Sway* (1890); *The Petrie Papyri Deciphered and Explained*, vols. viii, ix, and xi of the Cunningham Memoirs of the Royal Irish Academy (1891–1905); *Problems in Greek History* (1892); *The Empire of the Ptolemies* (1896); *Progress of Hellenism in Alexander's Empire* (1905); *The Silver Age of the Greek World* (1906); *What Have the Greeks Done for Modern Civilization?* (Lowell Lectures, 1909).

MAHÂ-KÂŚYAPA, mȧ-hä'-käsh'yȧ-pȧ, **KÂŚYAPA**, or **KASSAPA**. Name of one of the 80 great disciples of the Buddha Sakyamuni. He was originally a Brahman, but he became one of the Buddha's first converts. Buddha looked upon him as his successor, and after Buddha's death Kassapa urged the convening of the first general Buddhist council and was instrumental in arranging portions of the canonical works of the Buddhist scriptures. There are numerous legends connected with his life. Consult: Rhys Davids, *Buddhism* (London, 1890); Kern, *Manual of Hindu Buddhism* (Strassburg, 1896); Burnouf, *Introduction à l'histoire du buddhisme indien* (Paris, 1844); id., *Le lotus de la bonne loi* (ib., 1852).

MAHAN, ma-hăn′, ALFRED THAYER (1840–1914). An eminent American naval officer and author. He was born at West Point, N. Y., Sept. 27, 1840, and was the son of Dennis H. Mahan, professor of military engineering at the United States Military Academy and an author of works upon military engineering of wide repute. Alfred T. Mahan graduated from the United States Naval Academy as a midshipman in 1859; was commissioned as a lieutenant (1861), lieutenant commander (1865), commander (1872), captain (1885); was retired at his own request, after 41 years' service, in 1896, and in 1906 was advanced to the rank of rear admiral on the retired list. During the Civil War he served on the South Atlantic blockading squadron, on both Gulf blockading squadrons, and as instructor at the Naval Academy. After the war he commanded the *Aroostook* (1869–71), the *Wasp* (1873–74), the *Wachusett* (1883–85), and the *Chicago* (1893–95).

He took an active part in the establishment of the Naval War College, was ordered to duty in connection with it in 1885, was its president from 1886 to 1889, and was on special duty at the college when retired. In 1898, during the war with Spain, he was called to Washington as a member of the Naval War Board and in 1899 was made a delegate to The Hague Peace Conference. He was a member of the American Historical Association (president, 1902–03) and of the American Academy of Arts and Letters and received the degree of doctor of civil law from Oxford in 1894 and later that of doctor of laws from Cambridge, Harvard, Yale, McGill, and Columbia. He died at Washington, Dec. 1, 1914, of heart disease.

Although his career as a naval officer was highly creditable, Admiral Mahan's reputation rests chiefly upon his historical studies. As a naval historian, his work is of the highest order; as an exponent of naval grand strategy, he is unsurpassed. His first book, a small volume entitled *The Gulf and Inland Waters* (1883), was in no degree extraordinary, though excellent in its way. But in 1890 he published *The Influence of Sea Power upon History, 1660–1783.* This work, one of the greatest historical studies of all time (probably the greatest from a naval point of view), was widely read and at once established Mahan's reputation at home and abroad. Few works have received such instant and wide approval or have exercised so great an effect upon the policy of nations. Later of his writings, almost as powerful, in which his ideas were further developed and extended, include: *The Influence of Sea Power upon the French Revolution and Empire* (1892); *Life of Farragut* (1892); *Life of Nelson, the Embodiment of the Sea Power of Great Britain* (1896); *Interest of America in Sea Power, Present and Future* (1897); *Lessons of the War with Spain* (1899); *The War in South Africa* (1900); *The Problem of Asia* (1900); *Types of Naval Officers Drawn from the History of the British Navy* (1901); *Retrospect and Prospect* (1902), a collection of studies of international relations, naval and political; *Sea Power in its Relation to the War of 1812* (1905); *From Sail to Steam* (1907); *Some Neglected Aspects of War* (1907); *Naval Administration and Warfare* (1908); *The Harvest Within* (1909); *Interest of America in International Conditions* (1910); *Armaments and Arbitration* (1912); *Major Operations of the Navies in the War of American Independence* (1913). He also assisted Sir W. Laird Clowes in the preparation of *The Royal Navy: A History* (1897). At the time of his death Mahan was engaged as research associate in the department of historical research of the Carnegie Institution at Washington and was pursuing a special line of historical investigation with a view to writing a history of American expansion and its bearing upon sea power.

The influence of Admiral Mahan's works has been very great, not only upon naval authorities but upon military men, statesmen, diplomats, and parliaments as well. And it has led the various nations to a more careful consideration of their own naval problems and naval requirements, based upon the lessons of naval history which he was the first to explain fully and to impress effectively upon the world. As a result of his teachings, Germany began a systematic development of her fleet, and Great Britain, realizing as never before her necessity for naval preponderance, initiated a policy from which she has not since deviated. In the United States, except among naval officers, Mahan's influence has been much less than it deserved. By many of the people he was looked upon as a militarist and an opponent of the advocates of peace, chiefly because his historical expositions and conclusions were not carefully studied.

MAHAN, DENNIS HART (1802–71). An American military engineer. He was born in New York, and after graduating at West Point in 1824 was appointed to the engineer corps of the army. In 1825 he was made assistant professor of mathematics at the United States Military Academy, where, in 1832, he became professor of military engineering. He remained at West Point in that capacity till his death—he committed suicide by drowning while temporarily insane. He wrote a number of textbooks on civil and military engineering, which came into general use in schools and colleges in the United States. His *Treatise on Field Fortifications* appeared in 1836 and was supplemented in 1865 by *Military Mining and Siege Operations*, the two constituting parts i and ii respectively of *An Elementary Course of Military Engineering.* He also published *An Elementary Course of Civil Engineering* in 1837, which he rewrote and revised in 1868; *Advanced Guard, Outpost, and Detachment Service of Troops* (1847); *Elementary Treatise on Industrial Drawing* (1853); *Descriptive Geometry* (1864); and an edition of Moseley's *Mechanical Principles of Engineering and Architecture* (1856). A biographical memoir by Gen. H. L. Abbot will be found in volume ii of the *Biographical Memoirs of the National Academy of Sciences* (Washington, 1886).

MAHAN, MILO (1819–70). An American Protestant Episcopal minister, brother of D. H. Mahan, born in Suffolk, Va. He was educated at St. Paul's College, Flushing, Long Island; took orders in 1845; and became rector of Grace Church, Jersey City, in 1848, and assistant minister of St. Mark's, Philadelphia, in 1850. In 1857 he was elected professor of ecclesiastical history in the General Theological Seminary, New York, and in 1864 was called to St. Paul's Church, Baltimore. His published works are: *The Exercise of Faith* (1851); *History of the Church during the First Three Centuries* (1860; new ed., enlarged, 1872); *Reply to Colenso* (1863); *Palmoni: A Free Inquiry* (1864); *Comedy of Canonization* (1868). His works were collected and published, with a memoir, in three volumes, by Hopkins (New York, 1872–75).

MAHANADI, or **MAHANUDDY,** mä'hȧ-nŭd'ĭ (Skt., great river). A river of India, rising in the southern part of the Central Provinces (Map: India, E 5). It flows in an irregular easterly direction across Orissa to the city of Cuttack, where it divides into several arms, forming a large delta, through which it enters the Bay of Bengal about 100 miles southwest of the Ganges Delta. Its entire length is upward of 500 miles, and it is navigable during the rainy season about 300 miles to Sambalpur, but since the opening of the Bengal and Nagpur Railway it has been little used. During this season the volume of water discharged by the Mahanadi is very great, 1,500,000 cubic feet per second through Naraj Gorge as against 1125 cubic feet per second during the dry season; the surplus is being utilized for irrigation by an elaborate system of canals constructed by the British government.

MAHANOY (mä'hȧ-noi') **CITY.** A borough in Schuylkill Co., Pa., 50 miles by rail north by west of Reading, on Mahanoy Creek and on the Philadelphia and Reading and the Lehigh Valley railroads (Map: Pennsylvania, J 5). It is situated in the anthracite region and has extensive coal-mining and shipping interests, besides several shirt factories. The borough is well laid out and has a public-school library and a fine high school. Mahanoy City was settled in 1859 and was chartered as a borough in 1863. Pop., 1900, 13,504; 1910, 15,936; 1920, 15,599.

MAHANUDDY. A river of India. See MAHANADI.

MAHARIF, mä'hȧ-rēf. An antelope of the Sudan (*Hippotragus bakeri*, or *Egoceros equinus bakeri*), allied to the roan and sable antelopes and standing nearly 5 feet high at the withers. It is of a pale liver color, with penciled ears and black stripes across the shoulders. This fine antelope, whose horns are massive, was discovered by Sir Samuel Baker. For the latest account of this animal, consult Theodore Roosevelt, *Life-Histories of African Game Animals* (New York, 1914).

MAHASEER, mä'hȧ-sēr. A large barbel of India and Ceylon (*Barbus tor*), which reaches a length of 6 feet under favorable circumstances. These great fish reside in the streams of the highlands and form one of the principal attractions to the angler in the East. When the rainy season begins, the mahaseers ascend the hill rivers and their tributaries as far as possible and spawn, after which they drop down with the subsiding waters. When the ova hatch, the fry find themselves alone in the scanty headwaters and safe from the devouring appetites of their now absent parents. In these small streams and pools they grow almost unmolested until the next season's high water enables them to go downstream. Thus the continued supply of this and of various other similar fishes is secured to the people of the plains. Mahaseer fishing is one of the leading sports of India.

MAHATMA, mȧ-hăt'mȧ (Skt., possessing a great soul). A name applied in theosophy (q.v.) to a class of saints who are said to refrain from entering Nirvana (q.v.) that they may help mankind by their presence on earth. As a result of their asceticism and meditation, they are supposed to possess superhuman powers, by means of which they are enabled to project their astral bodies to vast distances. The idea of mahatmas is entirely theosophical. Real Oriental philosophy knows nothing of them.

MAHĀVANSA, mä'hȧ-väɴ'sȧ (Pali, great lineage). The title of a celebrated historical work, written in Pali, giving an account in epic form of the island of Lanka, or Ceylon, from the earliest times and the introduction of Buddhism down to the death of King Mahasena, which occurred 302 A.D., and extended later by various additions down to the time of the English occupation. Its authorship is attributed to Mahānāma, who is believed to have composed it between 459 and 477 A.D. Like the Dīpavansa (q.v.), the Mahāvansa is derived from a more ancient source, the historical portion of the *Aṭṭakathā*, which commented on the Buddhist Scriptures after giving an annalistic record by way of introduction. An incomplete edition of the Mahāvansa, with an English translation, was published by G. Turnour (Ceylon, 1837) and reissued later in revised form by L. C. Wijesinha, *Mahāwanso, Translated from the Pāli into English*, vol. i (Colombo, 1889). Consult Geiger, *Dīpavansa und Mahāvansa, die beiden Chroniken der Insel Ceylon* (Erlangen, 1901); the same author's *Die geschichtliche Ueberlieferung in Ceylon* (Leipzig, 1905; Eng. trans., 1908), as well as his edition of the work (London, 1908), which has been translated into English by himself and Bode under the title *The Mahāvaṃsa, the Great Chronicle of Ceylon* (London, 1912). See also the article of Franke, "Dīpavaṃsa und Mahāvaṃsa," in the *Wiener Zeitschrift für die Kunde des Morgenlandes*, vol. xxi (Vienna, 1907).

MAHAVIR, mȧ-hä'vēr', or **MAHAVIRA-CARYA,** mȧ-hä'vēr'ȧ-kär'yȧ (fl. ninth century) (Mahavir the learned). A Hindu mathematician who flourished in the ninth century in what is now the Kingdom of Mysore. He ranks as one of the four or five of the greatest Hindu mathematicians of early times and is one of the two best algebraists. He wrote a work entitled *Ganita-Sāra-Sangraha*, in nine chapters, which was translated into English by Prof. M. Rangācārya and was published by the Madras government in 1912. The work covers the field of elementary algebra and is very rich in Oriental problems.

MAHAVIRA, mä'hȧ-vē'rȧ (Skt. *mahā-vīra*, great hero). Name of the founder of the sect of the Jains. (See JAINISM.) He is known also as *Vardhamāna* 'the Exalted,' *Vīra* 'the Hero,' or as *Jina* 'the Victorious.' He is regarded as the twenty-fourth and last in the long list of deified masters (Tirthakaras) recognized in Jainism, and he appears to have been an elder contemporary of Buddha. His birthplace was at Kotigama (now Vasakund), in northeastern India. His legendary history is given in the *Kalpa-Sūtra* (q.v.) and the *Mahavīra-Charitra*, two works held in great authority by the Jains. According to these works, Mahavira's first birth occurred at a period infinitely remote; it was as a *nayasara*, head man of a village, that he first appeared in the country of Vijaya, subject to Satrumardana. He was next born as Marichi, the grandson of the first Jaina saint Rishabha; he then came to the world of Brahma, was reborn as a worldly-minded Brahman, and after several other births—each separated from the other by an interval passed in one of the Jaina heavens, and each period of life extending to many hundreds of thousands of years—he quitted the state of a deity to obtain immortality as a saint, and was incarnate towards the close of the fourth age, when 75 years and 8½ months of it remained. After he was 30 years of age he renounced worldly pursuits and departed to practice austerities. Finally he became an arhat or jina; and at the age of 72 years, the period of his liberation having arrived, "he resigned his breath," and his body was burned by Indra and other deities, who divided among them such parts as were not destroyed by the flames. The ashes of the pile were distributed among the assistants; the gods erected a splendid monument on the spot, and then returned to their respective heavens.

MAHAYANA, mä′hȧ-yä′nȧ (Skt. *Mahāyāna*, Great Vehicle). The development of Buddhism (q.v.) which within a few centuries after the death of Buddha became the dominant system in northern India as well as in Kashmir and Nepal, and later still spread into China, Korea, Japan, Tibet, Mongolia, etc. Hence it is sometimes spoken of as Northern Buddhism, or the Northern School, as distinct from the Southern School of Ceylon, Siam, and Burma, where the primitive system formulated by Gautama is still the prevailing form. The system of the Northern School is called *Mahāyāna*, "the Great Vehicle or Conveyance," because it is supposed to afford the means of salvation to a much larger number than can find places in the *Hīnayāna*, or "Little Vehicle," as the southern system is disparagingly designated by the followers of the Mahayana School. Mahayana Buddhism emphasizes the intellectual (*prajnā*) side of Buddhist discipline. It denies the existence of an ego, soul, or principle of individuation in both man and the objective universe. This nonego (*anātman*) theory culminates in the conception of *tatvā* or *dharmakāya*, by which term the Mahayana philosophers designate the ultimate conciliation of all contradictions in the absolute. Another doctrine peculiar to Mahanaya Buddhism is that of vicarious sacrifice (*parināmanā*), by means of which one individual may take on himself the *karma* (q.v.) of another. Accordingly the ideal Buddha is not the arhat, who merely seeks his own deliverance from the thrall of karma, but the Bodhisattva, who strives after universal salvation. These tenets have been elaborated in the course of centuries by many philosophers, the most famous being Açvaghosha, Nagarjuna (qq v.), Asanga, and Vasubandhu.

Under the influence of contemporary Hinduism and the Shamanistic notions and practices of the northern barbarians among whom Buddhism had begun to spread animistic beliefs and views concerning the supernatural were introduced, Shivaitic gods and practices were adopted, the attainment of magic powers by means of occult formulas and phrases was eagerly sought, and objects of worship were multiplied. A thousand new Buddhas were invented, among them the Adi-Buddha (q.v.), who came to be worshiped in Nepal as the self-existent Supreme Being. By spontaneous acts of contemplation and wisdom each of these Buddhas projected from his own essence other intelligences, the Bodhisattva, or spiritual sons, who are represented as having reached such a stage of saintship that but one more birth was necessary for them to become Buddhas, but who had decided to forego Buddhahood, and become the guardians of the Buddhist community on earth, and to help mankind, between the death of one earthly Buddha and the appearance of the next. Each of the five earthly Buddhas of the present Kalpa, or age, has his spiritual counterpart, who exists in formless worlds of meditation, as a Dhyani-Buddha (q.v.), and has his reflex Bodhisattva. Three correspond to the three Buddhas who preceded Gautama, one to Maitreya (q.v.), the coming Buddha (expected 2500 years hence), and one, Amitabha, represents the historical Buddha. His spiritual son is Avalokiteshvara, or Padmapani, better known in China as Kwan-yin (q.v.) and in Japan as Kwan-non. It is thus evident that Northern Buddhism has diverged most remarkably from the primitive system evolved by Sakyamuni. In Tibet and Mongolia, where it is known as Lamaism (q.v.), it has become the contrary of Gautama's system, and so far has celibacy been discarded that in certain Japanese sects the priests may marry.

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MAHDI, mä′dē (Ar. *al Mahdī*, the Guided One). The name given to the messenger of Allah, who is expected by certain sections of the Mohammedan world to complete the Prophet's work by converting or exterminating the infidels and by equitably dividing the world's goods. It is supposed that he will be a second Mohammed in name and in appearance and, since the time of the Abbasides, that he will carry the black flag of the Prophet. He is to meet Jesus in Damascus and Jerusalem, and to reign seven, eight, or nine years, filling the earth with justice. The idea is not contained in the Koran; but later tradition puts the following words into Mohammed's mouth: "Even though time shall have but one more day to last, God will call up a man of my family who will fill the earth with justice, as it is now filled with iniquity." The Mahdi idea arose in the eastern part of the new Arab empire, nourished by Jewish ideas of the coming of the Messiah and Christian ideas of the second coming of Jesus; more especially in Persia, where the idea of a Saoshyant (q.v.), or Redeemer, was part of the popular tradition of the ruler and the trend to mysticism and deification part of the national character. Its first manifestation was due to the anti-Arab feeling of the Persian Mohammedans who, as legitimists, gathered around Ali, the son-in-law of the Prophet, and resented the neglect of him in favor of the Ommiads, the bitterest opponents of the Prophet. Even during his lifetime Ali was deified, though against his will, by the Jew Abd Allah ibn Saba; and his violent death strengthened the belief that he would be awakened at the end of time and would conquer the world. By others Ali was considered simply to be the *wāsir* or vicar of the Prophet; and in the circles which regarded him as the legitimate Imam (leader) he was confounded sometimes with the Messiah, sometimes with Elijah. The subject became one of fierce dispute between the Shiites and the Sunnites. In the course of time the idea was used as a political weapon by numerous pretenders, and the Mahdi led the Holy War (*jihad*) against Moslems as well as against unbelievers. The first Mahdi was Mohammed ibn al Hanafiyyah, son of Ali, though not of Fatima, who was proclaimed by one Mukhtar in the reign of Abd al Malik (685–705) after the murder of Ali's son Husain. When Mohammed died the Persians refused to believe him dead, but asserted that he would return after 70 years. The idea spread, and since then Mahdis have risen very often among Persians, Egyptians, and the Arabs of the Sudan. One of the most famous of these was the veiled prophet Al Mokanna (see HAKIM IBN ALLAH), the subject of Moore's poem, who came to be regarded as divine and was worshiped for centuries. A large number of Shiites believe that there have existed only 12 Imams. When the twelfth died at Samarra (941), a child of 12 years, it was held that from that time on the Imam would remain concealed, though he may arise as Mahdi at any moment. Of the Egyptian Mahdis, the mad Hakim (996–1021) is most notorious. He also disappeared, but that he will appear again is the firm conviction of the Druses (q.v.) in the Lebanon Mountains and the Hauran. Of the sects that have sprung from this idea, the Ismailis may be mentioned, who expect the return of a Mahdi, Mohammed ibn Ismail of the family of Ali. The Karmathians also took their origin from this idea. (See MOHAMMEDAN SECTS.) Even orthodox Islam has been affected, and had its Mahdi in the person of Ibn Tumart (1121), the founder of the Almohade Berber power. See ALMOHADES.

The modern Mahdi is a product of one of the many religious orders (the Sammaniyyah) which, as a protest against the encroachment of the Christian civilization, honeycomb the Moslem world and are especially numerous in northern Africa. Born in 1844 or 1848 in the Province of Dongola, he took the name Mohammed Ahmed, asserting that his father was descended from Husain and his mother from Abbas. He studied at Kereri, 4 miles north of Omdurman, at Khartum, and in Berber. In 1870 he allied himself with the Sammani Order, passing part of his time with his uncle, a shipbuilder on the island of Aba in the White Nile, where he lived an ascetic life. He then entered a minor order at Musalemia on the Blue Nile. In these circles the year 1882 (1300 A.H.) was supposed to be the Mahdi year. Mohammed soon became famous in the country between the White and the Blue Niles. He was joined in Kordofan by a Bakkara Bedouin named Abd Allah, who afterward became his Caliph. He was proclaimed Mahdi in El Obeid in 1880, but returned to Aba to continue his ascetic life. In May, 1881, he came forward openly and sent circulars to the chiefs of Islam preaching the Jihad, or Holy War, the conversion of all unbelievers, a return to the simple faith of the Prophet, simplicity in dress and manners, and a sort of social communism and asceticism. Afraid of the Egyptian government, he collected a band of Dijem and Kinaru Bedouins and proclaimed the Jihad. In July, 1881, a small expedition sent against him was destroyed on the island. Imitating the Prophet, he left Aba, his Mecca, and came to Masa in southern Kordofan, which he proclaimed his Medina. For his subsequent movements, see SUDAN. He died of smallpox. Consult: Darmesteter, *The Mahdi* (New York, 1885); Snouck Hurgronje, in *Revue Coloniale Internationale* (1886); G. Hoffmann, *Mahdithum* (Kiel, 1899); Ernst Müller, *Beiträge zur Mahdilehre des Islams* (Heidelberg, 1901); D. B. MacDonald, *Aspects of Islam* (New York, 1911).

MAHÉ, mȧ'hȧ'. The principal island of the Seychelles (q.v.).

MAHÉ. A French town and colony in India, at the mouth of the Mahé River on the west coast, 5 miles south of Tellicherri (Map: India, C 7). It was settled in 1722 and was taken by the English in 1761 and again in 1779; it was finally restored to France in 1815. Area of colony, 25 square miles; pop., 1912, 10,431.

MAHICAN, mȧ-hē'kȧn (Amer. Indian, wolf). An important Algonquian tribe or confederacy formerly occupying most of the Hudson River valley and extending eastward into Massachusetts. They were closely connected with the Delaware and Munsee on the south and with the Mohegan and Wappinger on the east, all of these being known collectively to the French as *Loup*, or Wolf, Indians. When first known their council fire was at Schodac, on an island near Albany, and their territory contained some 40 villages. In consequence of the inroads of the Iroquois they removed their capital in 1664 to Westenhuck, the modern Stockbridge, Mass. By successive sales and removals, as the white settlements pressed upon them, they lost their territory and tribal identity, most of them becoming merged with the Delaware. In 1736 those remaining in western Massachusetts were gathered into a mission at Stockbridge and became known as the Stockbridge Indians. They are the only Mahican who have preserved their identity. A few others remained about their ancient homes on the Hudson for some years after the Revolution, but finally disappeared unnoticed. Those of Stockbridge removed later to the Iroquois country in New York, and are now settled, together with a part of the Munsee, upon a reservation near Green Bay, Wis., all completely civilized.

MAHI KANTHA, mȧ-hē' kän'tȧ (Banks of the Mahi). A group of native states in the northeastern part of Gujarat, India, forming a political agency under the government of the Bombay Presidency. It is bounded on the northeast by the Rajputana states of Udiapur and Dungarpur, on the southeast by Rewa Kantha, on the south by the British District of Kaira, and on the west by Baroda, Palanpur, and the British District of Ahmadabad. The area is 3125 square miles, of which the State of Idar, by far the most important of the group, occupies 1669 square miles. Eleven states besides Idar are of some importance; the remainder are estates belonging to Rajput or Koli thakurs (noblemen), once lawless feudatories of Baroda. The climate is fairly good; the hottest months are April and May and the coolest month January. The average annual rainfall at Idar is 34 inches. Of the total area about 27 per cent is cultivable. Three railways traverse the agency. The country is subject to native chiefs who are under the supervision of the British political agent. The population has been as follows: in 1872, 447,056; in 1881, 517,485; in 1891, 581,568; in 1901, 361,545 (the loss per cent being 37.8); in 1911, 412,631 (increase per cent 14.1). The large decrease in 1891–1901 was principally due to famine, especially in 1899–1900. In 1901, about 90 per cent of the inhabitants were Hindu, 5 per cent Mohammedan, and 3 per cent Jain; of the Hindus, about 92,000 were Kolis (laborers), 68,000 Kunbis (cultivators), 27,000 Brahmans. The aboriginal tribes are chiefly Bhils, who are animists, though many have been censused as Hindus; in 1901, they numbered about 18,000. The Bhils are a remarkable people, hardy and enterprising, but superstitious and often thievish. Of the total population in 1901, 12 per cent of the males and 0.3 per cent of the females were recorded as literate. Mahi Kantha contains six towns and 1723 villages. The towns are Idar, Amadnagar, Mansa, Vadali, Pethapur, and Sadra.

MAHIM, mȧ-hēm′. A town and railway station of the island of Bombay, nine miles north of the city of Bombay, situated on the south side of the channel separating the island from Salsette at the point where they are connected by a causeway. The passage is commanded by a fort. The town is inhabited chiefly by Christians of Portuguese descent, who have a church and other relics of former prosperity. The only orphanage in the province, a Scottish institution founded in 1859, is located here. The inhabitants are chiefly employed in fishing, the place being famous for its oysters. The bund was erected largely at the expense of Parsi benefactors. Pop., 1911, 6,643.

MAHINDA, mȧ-hēn′dȧ. The apostle who introduced Buddhism into Ceylon in the third century B.C. He is said to have been a son of Asoka (q.v.), and his birthplace was the town of Mahinda Vessanagara (now Besnagar) in the Province of Ujjain, western India, of which his father was Viceroy at the time. He was said to be 32 years of age when he set out on his mission to Ceylon, accompanied by other Buddhist missionaries; and it was his sister who is supposed to have brought the branch of the sacred bo tree (q.v.) to Ceylon. His death (193 B.C.) occurred at a place not far from Anuradhapura, at the age of 60. Consult C. M. Duff, *The Chronology of India* (London, 1899).

MAHLER, mä′lẽr, Gustav (1860–1911). An Austrian musical conductor and composer, born at Kalischt, Bohemia. He studied at the Iglau Gymnasium and in 1877 went to Vienna, where he became a student at the university and at the conservatory. After graduation he acted as conductor of various theatres at Cassel (1883–85); at Prague, as Anton Seidl's successor (1885–86); at Leipzig (1886–88); at the Royal Opera, Budapest (1881–91); at Hamburg (1891–97); and in the latter year became director of the Court opera at Vienna, which post he filled with distinction till 1907. During the season of 1907–08 he was conductor of the German operas at the Metropolitan Opera House, New York. Elected conductor of the New York Philharmonic Society in 1909, he reorganized this orchestra completely and brought it to a high level of excellence. He died in Vienna. He was one of the greatest masters of the baton, a man of indomitable energy and magnetic personality. As a composer, he failed signally because of lack of individuality, inventive power, concentration, and moderation. Yet his ambition was boundless. All his works are planned on the grandest scale, calling for an enormous technical apparatus, which he handles, indeed, with absolute mastery. The first performance of his *Eighth Symphony* at Munich (Sept. 12, 1910) was made the occasion of a special festival. The work lasted one hour and three-quarters, and Mahler conducted an orchestra of 170 players, a mixed chorus of 500 voices, and a children's chorus of 350 voices, assisted by organ and piano. He wrote nine symphonies (most of which demand the coöperation of a large chorus); two operas, *Die Argonauten, Rübezahl;* two song cycles with orchestra, *Kinder-Totenlieder* and *Das Lied von der Erde;* chamber music and songs. An unfinished tenth symphony was completed from the composer's sketches by Franz Mikorey (1913). Consult Paul Stefan, *Gustav Mahler: Eine Studie über Persönlichkeit und Werk* (Munich, 1912; Eng. trans. by T. E. Clark, New York, 1913), and Richard Specht, *Gustav Mahler* (Berlin, 1913).

MAHLMANN, mäl′mȧn, Siegfried August (1771–1826). A German poet, born and educated at Leipzig. He traveled as tutor until 1798; became editor of the *Zeitung für die elegante Welt* (1805) and of the *Leipziger Zeitung* (1810–17); wrote clever burlesques, including *Herodes vor Bethlehem* (1803), a satire on Kotzebue's (q.v.) *Hussiten vor Naumburg,* and *Marionettentheater* (1806). His best known productions are his lyrics, of which some are still popular in Germany, as e.g., *Mein Lebenslauf ist Lieb und Lust.* Mahlmann's *Erzählungen und Märchen* were published in 1802, and his collected works in 1839–40.

MAHLSTICK, mäl′stĭk (Ger. *Mahlstock, Malstock,* painting stick, from *malen,* to paint + *Stock,* stick), or Rest Stick. A round staff, from 3 to 4 feet long, tapering towards one end, which terminates in a small ball, sometimes covered with buckskin to prevent injury to the picture against which it rests. The mahlstick is held in the painter's left hand, to support the right hand, with which he holds his brush when painting. It was formerly more generally used than at present, as it is now thought to restrict the freedom of touch in painting.

MÄHLY, mā′lê, Jakob (1828–1902). A Swiss classical scholar and poet, born at Basel. He studied at Basel and Göttingen, and afterward became docent and professor of classical philology at the university of his native town. His works include: *Sebastian Castellio* (1862); *Angelus Politianus* (1864); *Geschichte der antiken Litteratur* (1880); *Richard Bentley* (1868); the epic poem *Mathilde* (1854); and excellent translations of Euripides, Æschylus, and Plutarch.

MAHMUD, mȧ-mo͞od′. The name of two sultans of Turkey.—Mahmud I (1696–1754) was Sultan from 1730 to 1754. His reign was of no especial importance.—Mahmud II (1785–1839) was Sultan from 1808 to 1839. He was a younger son of Abd-ul-Hamid I, and on the deposition of his brother, Mustapha IV, by Bairaktar, Pasha of Rustchuk, was raised to the throne, Aug. 1, 1808. Bairaktar became his Grand Vizier and aided him in his attempts to reform the organization of the Turkish army. The Janizaries, emboldened by their successful opposition to the same attempt on the part of Selim III, rose in rebellion, and the murder of the Vizier put a stop for the time being to the carrying out of any military reforms. Mahmud was also attacked by the rebels, but he secured his life and throne by the death of Mustapha, thus making himself the sole representative of the house of Osman, upon the continuance of which its followers believe the Empire to depend. The Ottoman Empire was in a critical condition, threatened by Russia and by rebellious vassals within its own borders. After a conflict which completely prostrated the strength of Turkey peace was concluded with Russia in 1812 at Bucharest, the Russian frontier being advanced to the river Pruth, but most of Wallachia and all of Moldavia were restored to Turkey. Mahmud now applied himself to the promotion of radical reforms in all departments of the government. Ali Pasha, the rebellious Pasha of Janina, was overthrown and killed in 1822. Greece revolted in 1821, and its independence was secured by the battle of Navarino in 1827, but it was not recognized as a separate kingdom by Turkey till April, 1830. During the progress of the Greek Revolution Mahmud had been steadily though secretly maturing his plans of military reform, and in June, 1826, the success of his schemes was crowned by the destruction of the Janizaries (q.v.), after which the army was reorganized on the European model and military schools were established. The consequent confusion into which Turkey was thrown was immediately taken advantage of by Russia for obtaining fresh concessions. Mahmud, however, despite these interruptions, proceeded in those plans of reform which he judged essential to the stability of the Empire; and the disastrous termination of the war with Russia (1828–29) (see ADRIANOPLE), far from interfering with his projects, only stimulated him to renewed exertion. Meanwhile the frequent unsuccessful wars, together with the disaffection manifested by the Christian population of Turkey, aroused in the mind of Mehemet Ali, Pasha of Egypt, the hope of achieving his independence. (See MEHEMET ALI.) The Egyptian army, under Ibrahim Pasha, overran Syria in 1831–32 and advanced through Asia Minor, winning a great victory at Konieh. The intervention of Russia compelled both parties to agree to a treaty (1833) which was satisfactory to neither. Mahmud, however, was forced to grant fresh concessions to the Czar, in return for the Russian aid, by the Treaty of Unkiar-Skelessi, July 8, 1833. He again pursued with undiminished vigor his reforms in the administration, the principal improvements being the modification and readjustment of the more oppressive taxes and the granting of increased privileges to foreign merchants. In 1839 he renewed the war with Mehemet Ali, but died on July 1, before he had heard of the decisive defeat of his army at Nizib, June 24. See TURKEY; MEHEMET ALI.

MAHMUD OF GHAZNI, gäz′nē. A Mohammedan ruler and conqueror. See GHAZNIVIDES.

MAHOG′ANY (from South Amer. *mahogoni*, the native name). The timber of a number of trees, the most highly esteemed being that of *Swietenia mahagoni*, a large tree of the family Meliaceæ, native of tropical America. The tree attains a height of 60 to 100 feet and a diameter of 6 feet or more, but these dimensions are not common. The former supplies of Cuba, Jamaica, and other islands of the West Indies are greatly reduced, and Central America meets the commercial demand. As occasional specimens the tree is met with in the extreme south of Florida, but not of a size or abundance to be of much economic value. The tree has compound leaves with usually four, sometimes three or five, pairs of leaflets, and panicles of small white or yellowish flowers that sometimes turn reddish. The wood is rich reddish brown, varying widely in its shades and markings and capable of receiving a high polish. The tree varies greatly in its rate of growth, being most rapid upon rich moist soils, but here the timber is frequently of coarser grain than when grown more slowly upon less fertile soils. The character of the timber produced in different countries varies. That from Santo Domingo (also known as Spanish mahogany) and Cuba is considered the best, and that from Honduras not so valuable, because it is less finely grained and marked. The cutting and removing of this timber to the coast for export give employment to a large number of men and oxen. The logs as exported are usually squared so as to get rid of as much of the less valuable sapwood as possible, and also to admit of better conveyance. Formerly mahogany was largely used in shipbuilding, especially in the Spanish navy, but it is now almost entirely a cabinetmaker's wood, entering into manifold uses either solid or as a veneer. Mahogany was introduced into England by Sir Walter Raleigh in 1597, it having been used in the repair of one of his ships; but while the wood was greatly admired, it did not become an article of commerce until about 150 years later. Two other little-known species, *Swietenia angolensis* and *Swietenia humilis*, occur in Central America. White mahogany, or Prima Vera, *Tabebuia donnellsmithii*, is a Mexican tree belonging to the family Bignoniaceæ. It attains a height of 50 to 75 feet and a diameter of 4 feet. The timber is imported and used for furniture to some extent. The term is also used in trade to include other woods. In India, *Cedrela toona*, a valuable tree of the same family as *Swietenia*, is called mahogany. Its timber is quite like the true mahogany. In Australia the name mahogany is applied to the timber of a number of species of *Eucalyptus* (q.v.). In the western United States *Cercocarpus ledifolius* is called mountain mahogany and *Cercocarpus parvifolius* valley mahogany. There are also several varieties of the latter. These trees belong to the family Rosaceæ, and are found from Colorado to New Mexico and westward to California. The East Indian mahogany is the timber of the rohuna tree (*Soymida febrifuga*), and the African mahogany that of *Khaya senegalensis*, both belonging to the same natural order as the true mahogany. *Chlorophora excelsa* furnishes some of the African mahogany; *Hovenia dulcis*, the Japanese mahogany; and *Triplochiton utile*, the Gold Coast mahogany.

MAHOGANY CEMENT. See CEMENT.

MAHOMET. See MOHAMMED.

MAHOMET'S (mȧ-hŏm′ĕts) **COFFIN.** According to an old legend, the Prophet's coffin in the tomb at Medina was suspended in the air, upheld, according to the faithful, by four angels who are relieved hourly. Another version of the fable describes the coffin as made of iron and held in the air by powerful magnets.

MAHÓN, mȧ-hōn′. The chief town of the island of Minorca. See Port Mahón.

MAHON, Charles. See Stanhope, Charles Mahon, third Earl.

MAHONE, mȧ-hōn′, William (1826–95). An American soldier and legislator. He was born in Southampton Co., Va., graduated at the Virginia Military Institute in 1847, and became a civil engineer. On the outbreak of the Civil War he joined the Confederate army and assisted in the capture of the Norfolk Navy Yard; participated in most of the battles of the Peninsular and Rappahannock campaigns; was distinguished for bravery at Petersburg, where he earned the title "The Hero of the Crater"; became a major general and commanded a division. After the war he became president of the Norfolk and Tennessee Railroad, took a prominent part in Reconstruction politics, and was effective in securing the nomination of Gilbert C. Walker in 1870, a compromise candidate for Governor of Virginia, whereby the conservatives regained control of the State. He was an unsuccessful candidate for the Democratic nomination to the governorship of Virginia in 1878, became the recognized leader of the "Readjusters," a Democratic faction which favored a partial or conditional repudiation of the State debt (see Readjusters), and in 1880 was elected largely by this faction to the United States Senate. He here took the unexpected course of allying himself with the Republicans, and thus brought about a tie in place of the slight Democratic majority which had been expected. He further alienated his constituents by his use of the Federal patronage in Virginia which had been assigned to him by President Arthur, and at the expiration of his term in 1887 he failed to secure a reëlection.

MAHO′NIA. A genus of shrubs closely related to the barberry (q.v.).

MAHO′NY, Francis Sylvester (1804–66), best known by his pseudonym of Father Prout. An Irish poet and humorist. He was born in Cork. His father wished him to prepare for the bar, but he chose the Church, and, after studying at the Jesuit colleges of Clongoweswood, County Kildare, Ireland, and St. Acheul, Amiens, and at Rome, was admitted to the Society of Jesus. He was appointed prefect of studies and afterward master of rhetoric in the Jesuit college at Clongoweswood, Ireland, but, becoming involved in a misadventure, was obliged to resign his position, and, returning to Italy, was dropped from his order. The priesthood, indeed, was not congenial to him, and clerical labors soon gave place to a literary life in London. He began in 1834 to contribute to *Fraser's Magazine* a series of papers which were afterward collected and published in book form as *The Reliques of Father Prout*. They comprised sketches in prose and verse ("The Bells of Shandon" being the best known), parodies, playful translations into Greek, Latin, and French, or from other languages. He contributed to *Bentley's Miscellany* and furnished an inaugural ode to the first number of the *Cornhill Magazine*. He was the first Rome correspondent of the London *Daily News*, and was Paris correspondent of the London *Globe* for several years after 1858. The last two years of his life were passed in a monastery. The *Reliques of Father Prout* was included in Bohn's Illustrated Library in 1860. Another volume, *Final Reliques*, was edited by Douglas Jerrold and published in 1876. *The Works of Father Prout*, edited by Charles Kent, were published in 1881. *Facts and Figures from Italy* (1847) was made from his Rome letters to the London *Daily News*. He died in Paris.

MAHOWA. See Butter Tree.

MAHRA, mä′rȧ, **MAHRI**, or Ehkili. A tribe of Hadramaut in southern Arabia. They are of interest as representing, according to several authorities, the ancient Himyarites. This gives them an importance outside their numbers and their primitive (or perhaps degenerate) culture. Their language seems related to that of the Himyarites. Consult: Van den Berg, *Hadramout* (Paris, 1886; Eng. trans., London, 1887); Hirsch, *Reisen in Süd-Arabien, Mahra-Land und Hadramut* (Leipzig, 1897); Bent, *Southern Arabia* (London, 1900).

MAHRATTAS, mȧ-rȧt′tȧz. A landed people inhabiting Central India, south of the Ganges from Gwalior to Goa. They are a mixed people, speaking a Hindu language, the Marathi (q.v.), and are Hindus in religion. There is no sharp line of demarcation between the Mahrattas and the Kunbis, or peasant cultivators, who worship the same local divinities without being Hindus in the proper sense of the term. The Mahrattas (Marathas) are a vigorous and active race, possessed of great endurance, and distinguished for military courage, with which cruelty has been combined. Their origin is obscure. They seem to have entered India prior to the Mohammedan conquests by Mahmud of Ghazni at the beginning of the eleventh century. The founder of the Mahratta power was Sivaji Bhonsla (1627–80), a freebooter or adventurer, whose father was an officer in the service of the last King of Bijapur. By policy or by force he eventually succeeded in compelling the several independent chiefs to acknowledge him as their leader, and with the large army then at his command he overran and subdued a large portion of the Emperor of Delhi's territory. In 1674 Sivaji was formally proclaimed Maharajah of the Konkan. He organized and levied a species of blackmail on his neighbors, called *chauth* (Skt. *caturtha*, "four"), a fourth of the land revenues. Sivaji's son, Sambaji, succeeded him in 1680, and after vigorously following out his father's policy was taken prisoner by Aurungzebe (q.v.) in 1689 and put to death. The incapacity of the subsequent rulers gave free rein to the intrigues and ambitions of their Brahman prime ministers or *peshwas*. (See Peshwa.) Soon the Peshwa became the hereditary sovereign, Sivaji's descendant being degraded to the position of a titular monarch. In this respect Mahratta history is of special interest as presenting a struggle between the priestly and warrior castes, with the victory finally won by the Brahmans. Early in the eighteenth century five Mahratta states were formed—Baroda, Gwalior, Indore, Nagpur, and the Peshwa's dominions (the capital of which was Poona). The usual internecine wars followed, and ultimately the East India Company was compelled to interfere. The invasion of the Empire of Delhi by the Persian Nadir Shah in 1739 afforded the Peshwas an opportunity of which they eagerly availed themselves, to wrest additional territory from the Mogul Emperor. From this time they discharged the office of arbiters in the quarrels between the Emperor, his Vizier, and his rebellious subjects; but the defeat they sustained in January, 1761, at the hands of Ahmed Shah, the ruler of Afghanistan, on the field of Panipat, greatly weakened their power for a time. Although there was some fighting as early as 1775, the real wars between the British and the Mahrattas began in 1779 during the administration of Warren Hastings. The third Mahratta war of 1803–05 was marked by the brilliant victories of Wellesley, Lake, and others over the armies of Gwalior, Indore, and Nagpur, and resulted in large acquisitions of territory by the British. In 1817 the Peshwa of the Mahrattas took up arms against the British, who were also attacked by the Rajah of Nagpur and by the ruler of Indore. The British speedily broke the power of the enemy and annexed the Peshwa's dominions to the Presidency of Bombay. Indore became a vassal state of the British, who at a later period annexed Nagpur. The Mahratta State of Gwalior, which had risen to great power in the eighteenth century, came under British control in 1843–44. The three Mahratta states of Indore, Gwalior, and Baroda refrained from participation in the Sepoy Mutiny of 1857. The ruler of Indore bears the name of Holkar (q.v.), that of Gwalior is called Sindia (q.v.), and that of Baroda is known as the Gaikwar (q.v.). Consult: Broughton, *Letters Written in a Mahratta Camp* (London, 1813; new ed., Westminster, 1892); Grant-Duff, *History of the Mahrattas* (Bombay, 1863); Forrest, *Selections from the State Papers in the Bombay Secretariat: Maratha Series* (ib., 1885); *Gazetteer of the Bombay Presidency*, vol. i (ib., 1896); Ranade, *Rise of the Maratha Power* (ib., 1900); and the index to the *Imperial Gazetteer of India* (Oxford, 1909).

MÄHREN, mâ′ren. See MORAVIA.

MÄHRISCH-OSTRAU, mâ′rĭsh ŏ′strou. A frontier town in the Crownland of Moravia, Austria, on the Ostrawitza, 60 miles west-southwest of Cracow (Map: Austria-Hungary, F 2). Its varied manufactures include iron, malt, tin, zinc, bricks, paraffin, ether, roofing paper, metal ware, malt, brandy, soap, petroleum, and rum. In the vicinity are the large Rothschild Iron Works of Witkowitz. The coal mining and the coke industry are also important and employ more than 25,000 men (in the community). Among its institutions is a school of mines. Pop., 1900, 30,125; 1910, 36,754.

MÄHRISCH-SCHÖNBERG. See SCHÖNBERG.

MAHWA, mä′wȧ. A tropical tree. See BUTTER TREE.

MAHY, THOMAS DE, MARQUIS DE FAVRAS. See FAVRAS, THOMAS DE MAHY.

MAI, mī, ANGELO, CARDINAL (1782–1854). A distinguished Italian antiquary and philologist. He was born in the village of Schilpario in Lombardy. He was educated and lived till 1808 in establishments belonging to the Jesuits, but obtained an appointment, first as associate and ultimately as custodian of the celebrated Ambrosian Library at Milan. In 1813 he published a translation of Isocrates, *De Permutatione*, with a commentary; but his reputation is due much more to his publications of the palimpsests or rewritten manuscripts, the first specimens of which he issued at Milan. (See PALIMPSEST.) His earliest publications in that line dealt with fragments of *Cicero's Orations* (*Pro Scauro, Pro Tullio, Pro Flacco, etc.*); of the *Vidularia*, a lost play of Plautus; of *Letters of Fronto* (q.v.), Marcus Aurelius' preceptor (later, he found many more letters of Fronto in the Vatican Library; see below); the *Chronicon* of Eusebius; nine books of the *Antiquitates* of Dionysius Halicarnassus, and other less important works, which, however, were entirely eclipsed by his well-known edition and restoration of the *De Republica* of Cicero, published in 1820. Meanwhile Mai had been invited to Rome by Pius VII and had been named chief keeper of the Vatican Library (1819). He at once turned his attention to the unedited manuscripts of the Vatican and, after a short examination of this noble collection, undertook, as the mission of his life, the task of publishing those among them which had been overlooked by earlier editors. This task he steadily pursued; and although he was appointed in 1833 to the onerous office of Secretary of the Propaganda and, in 1838, to the cardinalate itself, his Roman publications form a collection of an extent and importance almost unexampled in modern times. His first series of these publications was in 10 quarto volumes, entitled *Scriptorum Veterum Nova Collectio, e Vaticanis Codicibus Edita* (Rome, 1825–38). It consists, like the great collections of Mabillon, Montfaucon, D'Achery, and others, of miscellaneous unpublished works, partly sacred, partly profane, and indifferently in the Greek and the Latin languages, comprising an entire volume of palimpsest fragments of the Greek historians Polybius, Diodorus, Dion, Dionysius, and others. The succeeding collections—viz., *Classici Scriptores e Codicibus Vaticanis Editi* (10 vols., 8vo, 1828–38), *Spicilegium Romanum* (10 vols., 8vo, 1839–44), and *Patrum Nova Bibliotheca* (6 vols., 4to, 1852–54)—are all on the same plan, and all equally replete with new and interesting materials. Consult: Prina, *Biografia del cardinale Angelo Mai* (Bergamo, 1882); G. Poletto, *Del cardinale Angelo Mai e de' servi, studi, e scoperte* (Siena, 1889); J. E. Sandys, *A History of Classical Scholarship*, vols. i, iii (Cambridge, 1908).

MAIA, mā′yȧ (Lat., from Gk. *Maĩa*). 1. In Greek mythology, one of the Pleiades; the eldest daughter of Atlas by Pleione, a daughter of Oceanus. She became the mother of Hermes by Zeus. (Consult the so-called *Homeric Hymn to Mercury*, trans. by Shelley.) On account of the similarity of name she was identified by the Romans with Maia Majesta, an ancient Italian goddess of spring, who was also called Bona Dea, Ops, and Fauna. In this aspect she was regarded as Vulcan's wife, and a pregnant sow was sacrificed to her on the first of May. Consult W. W. Fowler, *Roman Festivals* (London, 1899), and Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912). 2. The name Maia is also given to the star 20 Pleiadum.

MAIDEN, THE. A name given to a machine in Edinburgh, Scotland, for beheading criminals. It was made in 1564 by order of the provost and magistrates, and the first recorded execution with it was that of Thomas Scott, one of the murderers of Rizzio, on April 3, 1565. In June, 1581, it was used in the execution of the Earl of Morton, by whom Hume of Godscroft alleges that it was invented. Its use was continued until 1710, when decapitation of criminals in Scotland was abolished. It was subsequently preserved in the Museum of the Antiquaries of

Scotland. It was first called indifferently "the maiden" and "the widow." A frightful instrument of punishment used in Germany in the Middle Ages was called "the virgin." But it had no resemblance to the maiden, which was similar to the French guillotine (q.v.), although it had no turning plank on which to bind the criminal. Consult W. T. McCulloch, "History of the 'Maiden' or Scottish Beheading Machine, with Notices of the Criminals who Suffered by it," in the *Proceedings* of the Society of Antiquaries of Scotland.

MAIDEN ASSIZE. A session of the English Court of Assize at which the justice takes his seat of office and immediately adjourns without hearing any trials. It is customary for the sheriff of the county to present the judge with a pair of white gloves as a symbol of the innocent character of his administration. See ASSIZE.

MAID'ENHAIR (*maiden* + *hair*, so called from the shape of the stalks), *Adiantum capillus veneris.* A small, delicate, and graceful fern, with bipinnate fronds, alternate obovate and wedge-shaped membranaceous pinnules on capillary stalks. It grows on moist rocks and old walls, especially near the sea in the south of Europe, where it covers the insides of wells and the basins of fountains with a tapestry of the most delicate green. It is also found in many places in the United States. Another species of the same genus, *Adiantum pedatum*, a native of North America and eastern Asia, with pedate leaves, has a sweet, fragrant rootstock, from which capillaire is made. One of the most popular ferns in house culture is the *Adiantum farleyense.* The name is also sometimes given to species of spleenwort (*Asplenium*), one of which is shown on the Colored Plate of FERNS.

MAIDENHAIR TREE, *Ginkgo biloba.* See GINKGO; GYMNOSPERMS.

MAIDENHEAD, mā'd'n-hĕd. A market town in Berkshire, England, situated amid beautiful scenery, on the Thames, 24 miles west of London. It carries on some trade in meal, malt, and timber. It was formerly known as Maidenhythe. Its charter was granted by Henry VI, and in 1578 it was made a free borough. It owns Kidwells Park and a large recreation ground and maintains a bathing establishment, isolation hospital, and sewage farm. Maidenhead, though an ancient town, is now practically a residential suburb for wealthy Londoners and a favorite starting place for boating parties on the Thames. Pop., 1901, 13,000; 1911, 15,219.

MAIDEN QUEEN. A title given to Queen Elizabeth of England.

MAID MARIAN. A maiden presumably of French origin, the traditional female companion of Robin Hood, the legendary English outlaw. Later she is represented as one of the characters in the famous Morris dance (q.v.), which formed one of the essential features in all the principal village festivities during the reign of Henry VIII of England. Maid Marian was personated originally by a boy in girl's clothing and was called queen of the May, as this dance was one of the sports of May Day, Holy Thursday, weddings, etc. In fiction *Maid Marian* has been made the heroine of successful stories, notably *Maid Marian* by T. L. Peacock. See HOOD, ROBIN.

MAID'MENT, JAMES (?1795–1879). A Scottish antiquary, born in London. He was called to the Scottish bar in 1817 and soon gained reputation as an advocate in peerage cases and in general practice. In consequence of his interest in antiquarian researches he became known to Scott, and an intimate friendship followed. He died at Edinburgh, Oct. 24, 1879. Among his many publications are: *Reliquæ Scoticæ* (1828); *Analecta Scotica* (1834–37); *Bannatyniana: Notices Relative to the Bannatyne Club* (1836); *Edinburgh Portraits* (1837); *Scottish Elegiac Verses* (1842); *Scottish Ballads and Songs* (1859); *A Book of Scottish Pasquils* (1868); and, with W. H. Logan, the valuable work, *Dramatists of the Restoration* (14 vols., 1877). Maidment also gathered a library of rare books, the sale of which took 15 days (1880). Consult: T. G. Stevenson, *Bibliography of Maidment* (Edinburgh, 1883); J. Irving, *Book of Scotsmen Eminent for Achievement* (London, 1882); J. C. Hadden, in *Dictionary of National Biography*, vol. xxxv (ib., 1893).

MAID OF ARTOIS, är'twä', THE. An opera by Balfe (1836) with libretto by Alfred Bunn. It introduces the song "The Light of Other Days," said to have been the most popular song of its time in England.

MAID OF ATHENS. A well-known poem by Lord Byron, written in Athens and said to have been inspired by Theresa Macri, the daughter of the English vice consul.

MAID OF BATH, THE. 1. A title given to Miss Linley, afterward the wife of Richard Brinsley Sheridan. 2. A farce by Foote (1771), in which, in the character of Flint, he pilloried Walter Long for his treatment of Miss Linley.

MAID OF HONOR. See HOUSEHOLD, ROYAL.

MAID OF KENT. A name frequently given to Elizabeth Barton (q.v.).

MAID OF ORLÉANS, ôr'lâ'äɴ'. See JOAN OF ARC.

MAID OF THE MIST. 1. A name given to the heroine in Scott's *Anne of Geierstein.* 2. A small steamboat once used on the Niagara River, between the Falls and the Whirlpool Rapids, to carry visitors close to the cataract. In 1867, in order to avoid seizure by the sheriff, she made the dangerous trip through the Rapids with only slight injury.

MAID'STONE. The county town of Kent, England, and a municipal borough, on the Medway, 34 miles east-southeast of London (Map: England, G 5). It is built on the slopes of a picturesque valley on the east bank of the river, which is spanned by a handsome bridge. The principal buildings of interest are the ancient collegiate church of All Saints, the college of All Saints, both dating from the fourteenth century, and the sixteenth-century manor house, in which the finest provincial museum in England is located. The archbishops of Canterbury maintained a palace here until the Reformation, the building now being used to house the school of science and art. The municipality maintains free libraries, parks and recreation grounds, public baths, a corn exchange, concert hall, and hospital. Sewage is chemically treated for fertilizing purposes, and there is a refuse destructor in conjunction with an electric-lighting plant. Maidstone is the centre of a large agricultural and hop-growing district, and its industries include breweries, oil mills, and paper mills, rope, cement, lime, and brick works. It was the Saxon Medwegestun. It witnessed the defeat of the Kentish Royalists by Fairfax in 1648. Pop., 1901, 33,500; 1911, 35,475. Consult: Gilbert, *History of the Collegiate Church of All Saints* (Maidstone, 1866); Russell, *History of Maidstone* (London, 1882; new ed., 1885); Cave-Browne, *Maidstone* (ib., 1889).

MAID'S TRAGEDY. A play by Beaumont and Fletcher, written not later than 1611 and printed in 1619. The fourth and fifth acts are mainly by Fletcher.

MAIDU, mī′dōō (the people). A group of small tribes, formerly living along the eastern affluents of the Upper Sacramento River in northern California. They went nearly naked, lived chiefly upon acorns and piñons, and built a species of hogân or dugout of boards, with wicker granaries for storing acorns, and large round town houses for public ceremonials. They had a number of dances, the chief of which was the acorn dance, and a peculiar secret society for boys. They constituted a distinct linguistic stock known as the Pujunan. They are now gathered upon the Round Valley Reservation to the number of 1100. They are basket makers, but fashion simpler designs than the neighboring Pomo tribes. Consult: R. B. Dixon, "Maidu Myths" and "The Northern Maidu," in *American Museum of Natural History, Bulletin*, vol. xvii (New York, 1902–05); id., "Maidu," in Franz Boas, *Handbook of American Indians*, part i (Washington, 1911); id., "Maidu Texts," in *American Ethnological Society, Publications*, vol. iv (Leyden, 1912).

MAIFELD. See CHAMP DE MARS.

MAIGNAN, mȧ′nyäɴ′, ALBERT (1846–1908). A French decorative and historical painter. He was born at Beaumont (Sarthe) and studied under Noël and Luminais. He received many awards at the Salon, including the medal of honor in 1892, and was given the cross of the Legion of Honor in 1895. Although the influence of the Academic school is occasionally manifest in his work, the best of it is characterized by harmonious color, poetic imagination, and careful draftsmanship. Such are his paintings "Homage to Carpeaux" (1892, Luxembourg), "The Voices of the Tocsin" (Amiens Museum), and the "Green Muse." Among his best historical compositions are: "Dante Meeting Countess Matilda" (1881, Amiens Museum); "Assault on Pope Boniface VIII at Anagni" (Metropolitan Museum, New York); "Louis IX Consoling a Leper" (Angers Museum); "Carlo Zeno" (Lille Museum). His decorative works include the ceiling and panels of the foyer of the new Opéra-Comique, Paris, the cupola of the chapel commemorating the fire of the Bazar de Charité, and designs for the Gobelin tapestries.

MAI′GRE. A fish. See MEAGRE.

MAIKOP, mī′kŏp. A town in the territory of Kuban, Caucasia, situated on a branch of the main railroad line to Baku, 93 miles southeast of Ekaterinodar, the capital (Map: Russia, F 6). It is a growing town and carries on a brisk trade in the agricultural products of the fertile region in which it is situated and in oil from the local wells, which are very productive. Pop., 1897, 34,191; 1912, 45,089.

MAIKOV, mī′kôf, APOLLONIUS NIKOLAIEVITCH (1821–97). A Russian poet, born in Moscow. He was the son of a painter and was educated at St. Petersburg University and, for an artistic career, in Italy. Later he was made a government censor of foreign publications and became a Panslavist. He translated Neo-Greek and Old Slavonic poems, published a volume of original verse in 1842, two lyrical dramas, *Tri Smerti* (Three Deaths) and *Dva Mira* (Two Worlds, contrasting Christian and pagan Rome), and such epics as *Savonarola*, *Clermont Cathedral*, *The Queen's Confession*, and *The Princess*, which was his best effort. Maikov drew his inspiration from the Greek and Roman classics, from mediæval and modern romance, and from the older and more recent Russian history. His complete works were published in St. Petersburg (4 vols., 7th ed., 1901).

MAIKOV, mī′kôf, VALERIAN NIKOLAIEVITCH (1823–47). A Russian social philosopher and literary critic. After an excellent home education (the famous Goncharov was one of his tutors), he entered the faculty of law at St. Petersburg University, where one of his special interests was political economy. His first important article was *On the Relation of Production to the Distribution of Wealth* (1842). He also participated in the compilation of a noteworthy *Pocket Dictionary of Foreign Words Entering into Russian* (2d ed., 1845–46), which might have played the part of a *Dictionnaire philosophique* in Russia, had it not fallen under the ban of censorship. His uncompleted work entitled *The Social Sciences in Russia*, which appeared in the *Finnish Courier*, again displayed his wonderful grasp of political and sociological science. Literary criticism he essayed for the first time in 1846, when, in an article on the poet Koltsov, he boldly challenged some well-known canons of art accepted by the greatest critic of his time, Belinsky (q.v.). A year later, at 24, he died of apoplexy.

Maikov's special distinction as a social philosopher lay in his early attack on the political economists of Adam Smith's school for their study of wealth as an abstract fact and not as a social factor. Being averse to metaphysics, he was especially drawn to the philosophy of Auguste Comte (q.v.). He was the first, too, in Russia to advocate profit sharing for labor, while his views on art curiously forestalled those of Guyau (q.v.). In these and other respects Maikov very early acquired those Western ideas which were to revolutionize Russian thought. Only his premature death prevented him from developing them at length.

MAILÁTH, moi′lät, JÁNOS, COUNT (1786–1855). An Hungarian poet and historian, born at Pest. He studied at Erlau and Raab and was for a time chancery councilor at Pest. This post he lost in 1848 and after seven years of literary labor at Vienna and Munich committed suicide by drowning, with his daughter, in the Starnberger See. His works include: *Gedichte* (1824); *Magyarische Sagen und Märchen* (1825; 2d ed., 1837); a translation of some of Kisfaludy's poems (1829); a valuable edition of the Kalocsa Codex, containing several poems in Old High German; and the historical works *Der ungarische Reichstag von 1830* (1831), *Geschichte der Stadt Wien* (1832), *Geschichte des österreichischen Kaiserstaates* (1834–50), and the *Geschichte der Magyaren* (1828–31), the most valuable of his productions, with two supplementary volumes (1854).

MAILDUN, mäl′dōōn, **MAELDUIN,** or **MAELDUNE.** The hero of an ancient Irish romance known as *The Voyage of Maildun*. It is one of a group of Imrama, or voluntary sea expeditions, of which the *Voyage of Saint Brendan* (q.v.) is equally well known. Maildun was the son of Aillill of the Edge of Battle, an illustrious man of the tribe of Owenaght of

Ninus in the County of Clare by the sea. Before the hero's birth, his father had been slain by a band of robbers who had come over the sea. When Maildun had grown up he set forth in a triple-hide curragh (a canoe made of a framework of wood covered with skins) in search of his father's murderer. In his voyage on the western sea for three years and seven months he visited the island of huge ants, red-hot animals, burning places, the isle of the blest, and other marvelous places. He found his enemy, whom he forgave for the hospitality accorded him after so many perils. The text exists in a redaction of the eleventh century, but the story itself probably goes back to the eighth century. The story is beautifully told by Tennyson in the *Voyage of Maeldune.* For a prose translation, consult P. W. Joyce, *Old Celtic Romances,* translated from the Gaelic (3d ed., New York, 1898). A French version was published by F. Lot in d'Arbois de Jubainville's *Cours de littérature celtique,* vol. v (Paris, 1892). Consult also Nutt and Meyer, *The Voyage of Bran* (2 vols., London, 1895–97).

MAILED CAT. See Catfish.

MAILLET, mȧ'yā', Jacques Léonard (1823–94). A French sculptor, born in Paris. He was a pupil of Pradier and won the Prix de Rome in 1847. His "Agrippina and Caligula" (1853) was the first of his groups to gain recognition; his "Springtime of Life" was at the exposition of 1855; and his other works include: "Agrippina Bearing the Ashes of Germanicus" (in the Garden of the Luxembourg), which was in the exposition of 1867, and "The Satyr and Love," shown in the exposition of 1878. There are decorative groups by him in the courtyard of the Louvre, on the Opera House, and in the churches of St. Clotilde, St. Leu, and St. Séverin in Paris. He also erected a monument to the Bonaparte family at Ajaccio.

MAILLY, William (1871–1912). An American Socialist and journalist, born in Pittsburgh. He was educated in English and Scottish schools; worked in the mines of Illinois and Alabama; and in 1894 became state secretary of the United Mine Workers' Union of Alabama. He was associate editor of the Birmingham *Labor Advocate* (1895–96) and of the *Worker,* New York (1901 and 1906–07), editor of the Nashville *Journal of Labor* and the Haverhill (Mass.) *Social Democrat* (1899–1900), and managing editor of the New York *Evening Call* (1908–09). He served as an organizer of the Social Democrat (now Socialist) party in New York and Chicago in 1898, as secretary of the National Socialist Convention at Indianapolis in 1901, and as organizer and secretary of the Socialist party of Massachusetts in 1902. He was national secretary of the Socialist party in 1903–05 and a member of the National Executive Committee in 1905–06, and he managed the Socialist presidential campaign of 1908.

MAIL-SHELL. A chiton. See Chiton.

MAIMAICHEN, mī'mī'chĕn', or Maimatchin, "to buy and sell place," i.e., trade settlement. The name of two Chinese towns in Mongolia. One is situated 2½ miles east of Urga and was established in the early eighteenth century to further Chinese trade. It was originally a stockaded inclosure with six gates, which are still closed at sunset. A group of Mongol suburbs now surround it. Pop., 4000 to 5000, of whom 1200 to 1500 are Chinese. The other town is situated on the Russian frontier, opposite Kiakta, and has but few permanent residents, most of them being Chinese merchants who come there on business (Map: Chinese Republic, J 2). This town also has a palisade and has two fine temples. Its trade has greatly decreased owing to the Siberian and Manchurian railways, which have seriously diminished the value of the Mongolian caravan routes.

MAIMANA, mī'mȧ-nä'. A town of Afghanistan. See Maimene.

MAIMATCHIN. See Maimaichen.

MAIMBOURG, măn'bōōr', Louis (1610–86). A Roman Catholic historian and polemical writer. He was born in Nancy, France, and became a Jesuit in 1626. As he was an earnest Gallican, the Pope in 1682 secured his dismissal from the Jesuit Order. He died in Paris, a pensioner of Louis XIV, Aug. 13, 1686. His historical works appeared in Paris in 12 volumes in 1686; his polemical works against Protestantism in 1682. English translations were made of *The History of the League* (1684); *The History of the Holy War* (1686); *An Historical Treatise of the Foundation and Prerogatives of the Church of Rome and of her Bishops* (1685); *The History of Arianism* (1728); but his works lack historic accuracy. Several of his books are upon the papal Index. Consult Reusch, *Der Index der verbotenen Bücher,* vol. ii (Bonn, 1883–85).

MAIMENE, mī'me-nä', or **MAIMANA.** A town in north Afghanistan (Map: Afghanistan, L 5), about 180 miles northeast of Herat. Previous to 1874 it was the capital of an independent khanate of the same name, and an important commercial centre, with a population estimated at 60,000. In that year, however, the city was captured and a large part of its inhabitants massacred after a siege of six months by the Afghans, who annexed the khanate to their territory. The town has dwindled to a village of about 2000 inhabitants.

MAIM'ING (from *maim,* from OF. *mehaigner, mahaigner,* to maim, doublet of *mayhem;* possibly connected with Bret. *machaña,* to mutilate, or with OHG. *mangōn, mangalōn,* Ger. *mangeln,* to lack, Eng. *mangle*). A modern statutory offense, generally consisting in the infliction of a permanent physical injury on man or beast. In England the term is employed in the sense of mayhem (q.v.) when applied to injuries to human beings; but when applied to malicious damage to cattle or other animals (see Malicious Damage Act, 1861, 24 and 25 Vict., c. 97, §§ 40, 41) it is used in the popular sense of mutilating. It bears this broader signification in most statutes in the United States. The offense is generally declared to be a felony when committed against human beings or cattle, and a misdemeanor when against other animals than cattle. Maiming one's self to escape the performance of some legal duty, or in order to excite sympathy and obtain alms, is punishable under many modern statutes. Consult Bishop, *Commentaries on the Law of Statutory Crimes* (3d ed., Chicago, 1901), and Archbold, *Pleading, Evidence, and Practice in Criminal Cases* (23d ed., London, 1905). See Mayhem.

MAIMON, mī'môn, Salomon (1754–1800). A Jewish German philosopher, born in Lithuania. He studied medicine in Berlin, but finally devoted himself to the Talmud, with promise of great ability; in 1770 he broke with orthodox Judaism by a critical commentary on the *More Nebukhim* of Maimonides. In Berlin, where he went in 1773, he became interested in Wolff's metaphysics, and was well received by Mendelssohn. After 1788, when he became acquainted with Kant's views all his philosophizing started from Kant's results. Maimon's most important work was the critical *Versuch über die Transcendentalphilosophie* (1790), which had great influence in philosophical circles. In this work he criticizes Kant for certain inconsistencies and reaches the view that a priori knowledge holds not of experience but in the realm of logic and mathematics. Among his other works mention may be made of *Versuch einer neuen Logik* (1797) and of *Kritische Untersuchungen über den menschlichen Geist* (1797). His autobiography, edited by Moritz in 1792, was translated into English by Murray (1888). Consult Witte, *S. Maimon* (Berlin, 1876).

MAIMONIDES, mī-mŏn′ĭ-dēz, properly Moses ben Maimon ben Joseph, Ar. Abu Amram Musa ibn Maimun Obeid Allah al Kortobi (1135–1204). A great Jewish scholar and philosopher. He was born at Cordova, March 30, 1135. Little is known of his early life. He received his first instruction from his father, himself a learned man, and later devoted himself to the study of Greek (Aristotelian) philosophy, the science of medicine, and theology, under the most distinguished Arabic masters of the time. When Abd al Mumin, the Almohade ruler, captured Cordova in 1148 (see Almohades), all Jews and Christians residing there were forced to embrace Islam or emigrate. Maimonides' family outwardly adopted the Mohammedan faith, or rather renounced the public profession of Judaism, but after a time, finding no sign of a change, resolved to emigrate. In 1159 they were at Fez, in 1165 at Acre, and thence by way of Jerusalem they proceeded to Cairo, where the father died. Maimonides' great knowledge of medicine soon gained him the position of physician to Saladin, the Sultan of Egypt, and by virtue of his rabbinic learning in 1177 he became rabbi of Cairo. He died Dec. 13, 1204. His body was carried to Tiberias and in course of time his tomb became a place of pilgrimage. Maimonides' importance for the religion and science of Judaism and his influence upon their development gained for him the title of a "second Moses." His activity extended over the range of Jewish studies—theology, exegesis, and philosophy. Imbued with the spirit of Greek speculation, and acquainted with the best of Arabic thought, he endeavored to explain the Bible by the light of reason, and was the founder of a rational exegesis. When literal interpretation seemed to jar upon the feeling of reverential awe due to the Most High, he did not hesitate to substitute an allegorical interpretation. The most striking feature of his philosophical system is its close similarity to that of Averroës. It is a grand attempt to reconcile rabbinic Judaism with the prevailing Aristotelian system of thought as modified by Arabic philosophers. He differs from Aristotle, however, in maintaining that creation by the divine will proceeded from nothing (*creatio ex nihilo*). He held to the freedom of the will, and condemned a life of asceticism, or dreamy albeit pious contemplation. He taught that the body as well as the soul should be developed and cared for, and hence the study of natural science and medicine is a matter of prime necessity. The soul, and the soul alone, is immortal, and the reward of virtue consists in its—strictly unbodily—bliss in a world to come; the punishment of vice is the loss of the soul. Maimonides' first important work was an Arabic commentary on the Mishna, called by him *Siray* (Illumination) and finished in 1168. It was translated into Hebrew, and for more than five centuries has been deemed so essential a part of the Talmud itself that no edition of the latter is considered complete without it. This was followed by the "Book of Precepts," in Arabic, which is to be considered as an introduction to the gigantic work which followed in 1180, in Hebrew, under the title *Mishne Thora* (Second Law; also called *Yad ha-khazaka*, the Strong Hand). It is a minute and systematic presentation of the Jewish law as developed by the Talmud, and to it he devoted 10 years of his life. The summit of his renown, Maimonides attained in his Arabic *Dalalat al-hairin* (Heb. *More Nebukhim*, Guide of the Perplexed), a philosophical and rationalistic work on exegesis, finished c.1190, which led to a long and bitter contest between the orthodox and liberal in Judaism. His attempt to systematize the Talmudic precept also aroused opposition; and one result of it, unforeseen by himself, was to increase the punctiliousness in carrying out ceremonial observances. It was felt also that there was a lack of consistency between Maimonides the philosopher and Maimonides the theologian, and it is indeed difficult to reconcile his rationalistic exegesis and his untrammeled philosophical speculation with his attitude towards the minute ceremonies of rabbinic Judaism. Maimonides' minor works include medical, mathematical, logical, and other treatises, legal decisions, theological disquisitions, etc. As early as the thirteenth century portions of his books in Latin translation were in use in European universities, and the *Guide of the Perplexed* was followed to a certain extent by Albertus Magnus and Thomas Aquinas. There is an English translation of the *Guide of the Perplexed* by Friedländer (3 vols., London, 1885). The Arabic of the original with French translation was published by Munk (Paris, 1856–66). Consult: Joel, *Die Religionsphilosophie des Mose ben Maimun* (Breslau, 1859); Grätz, *History of the Jews*, vol. iii (Eng. trans., Philadelphia, 1873); Kaufmann, *Geschichte der Attributenlehre* (Gotha, 1877); Karpeles, *Geschichte der jüdischen Litteratur* (Berlin, 1886); Bacher, *Bibelexegese Moses Maimunis* (Strassburg, 1897); Yellin and Abrahams, *Maimonides* (Philadelphia, 1903), with bibliography; Neumark, *Geschichte der jüdischen Philosophie des Mittelalters*, vols. i, ii (Berlin, 1907–10).

MAIN, mīn. A river of Germany and the largest right affluent of the Rhine. It rises in two head streams in the Fichtelgebirge in northeast Bavaria and flows in a westerly direction through the northern part of Bavaria and then on the borders of Hesse and the Prussian Province of Hesse-Nassau, joining the Rhine at Mainz (Map: Germany, C 4). The entire length of the Main is 307 miles, and it is navigable from its confluence with the Regnitz, a distance of about 205 miles. The principal towns on its banks are Würzburg and Frankfort. The Main, in spite of its length, is not very important from a commercial point of view, owing to frequently occurring shoals, the tortuousness of its course, and the small volume of water in summer time, so that at Würzburg it serves for little except a considerable flotation of timber. It has, however, been canalized between Mainz and Frankfort, so as to admit vessels of 1000 tons, and its waters communicate with those of the Danube by means of the Ludwigs-Kanal with a depth of 4.2 feet.

MAINA, mī′nȧ. See MAYNA.

MAINAN, mī′nan. A linguistic stock of Ecuador, South America, included in which is probably the Laman, formerly listed as a separate stock. Consult D. G. Brinton, *Studies in South American Native Languages* (Philadelphia, 1892), under "Jivaro" and Beuchat and Rivet in *Zeitschrift für Ethnologie*, vol. xli (Berlin, 1909).

MAINDRON, măɴ′drôɴ′, GEORGES RENÉ MAURICE (1857–1911). Pseudonym, RENÉ GERBERT. A French historical novelist. The French government sent him on various scientific missions to New Guinea, Indo-China, etc., and made him a Knight of the Legion of Honor. At various times he held office in a number of scientific societies. He married Miss Helen Heredia, daughter of the poet José María de Heredia. His writings include: *Les papillons* (1887); *Les armes* (1891); *Les chasseurs d'oiseaux du paradis* (1891); *Un capitaine d'aventurers* (1891); *Les hôtes d'une maison parisienne* (1892); *Les musées d'Espagne* (1892); *Les briseurs d'image* (1892); *Manuel du naturaliste* (1894); *Le tournoi de Vauxplassant* (1895), crowned by the French Academy; *Blancador l'avantageux* (1900); *L'Art indien* (1900); *Monsieur de Clirambon* (1904); *Le meilleur parti* (1905), comedy; *L'Arbre de science* (1906); *L'Inde du sud* (1907); *Le carquois* (1907); *La gardienne de l'idole* (1910); *Ce bon M. de Véragues* (1911).

MAINE, mān. One of the ancient provinces of France, bounded on the north by Normandy, on the east by Orléanais, on the west by Brittany, and on the south by Anjou and Touraine. It corresponds approximately to the modern departments of Sarthe and Mayenne. The crown obtained final possession of it in 1481, after the house of Anjou had become extinct. The capital was Le Mans.

MAINE (called "The Province or Countie of Mayne" in the charter granted by Charles I in 1639, because regarded as part of "the Mayne land of New England"). A North Atlantic State of the United States, belonging to the New England group, and the most northeasterly State of the Union. It lies between lat. 43° 4′ and 47° 28′ N. and between long. 66° 57′ and 71° 7′ W.; it is bounded on the northwest by the Canadian Province of Quebec, on the northeast by the Province of New Brunswick, on the southeast by the Atlantic Ocean, and on the west by the State of New Hampshire. Its extreme length is a little over 300 miles, its extreme width 185 miles, and its total area 33,040 square miles, the land amounting to 29,895 square miles. Maine is nearly as large as all the rest of the New England States combined, and is thirty-eighth in size among the States of the Union.

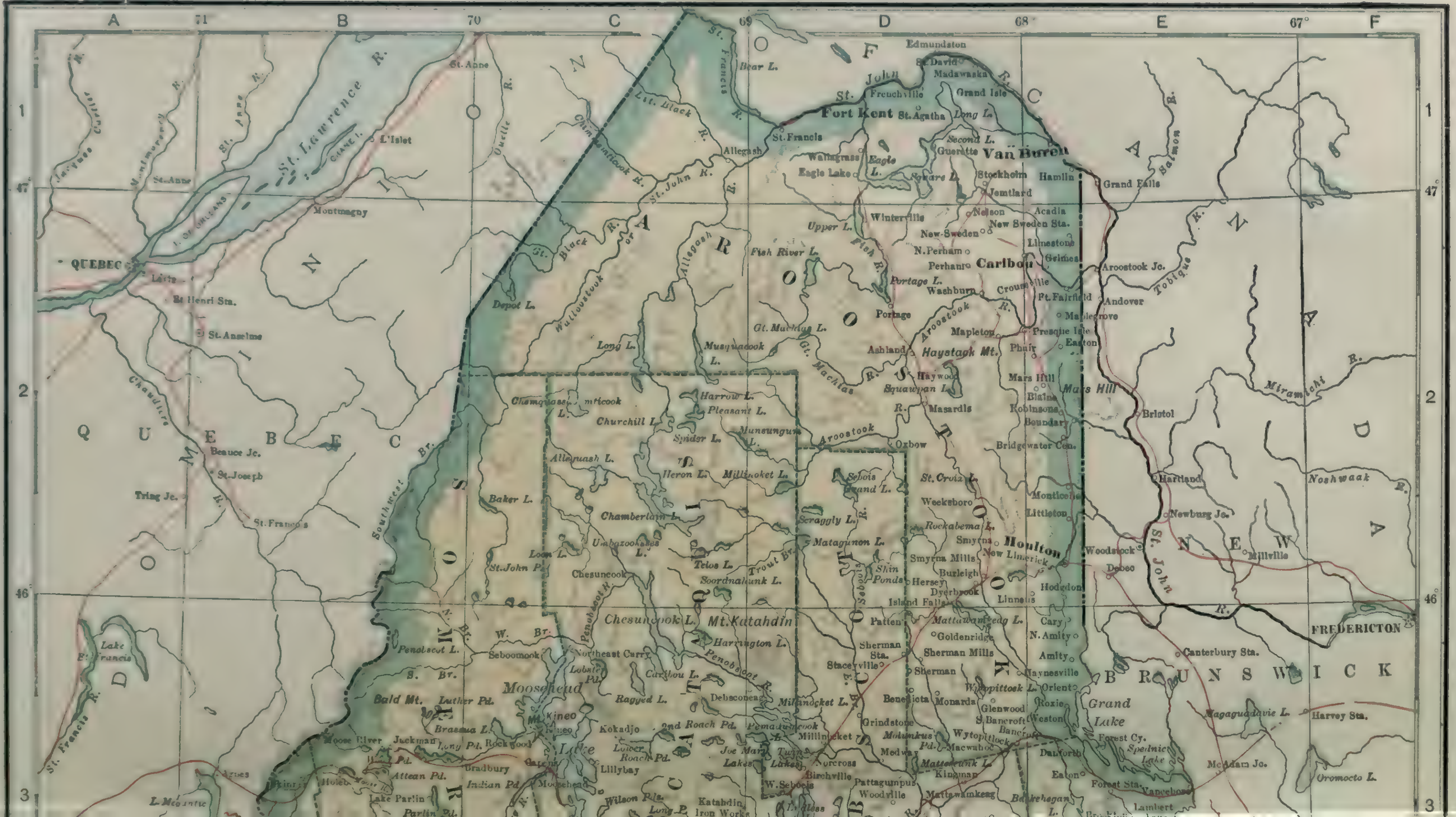
Topography. The surface of Maine is in general moderately hilly, becoming mountainous in the west and north. The elevation rises from the coast northward and from east to west towards the interior. Along the coast in the southwest corner the surface falls into low, flat, and even marshy land, and the country maintains its low and generally level character as far as the Kennebec River. East of the Kennebec the coast region rises to abrupt and bold elevations of 1000 to 1500 feet. The general slope of the State is determined by the main plateau, which crosses it in a northeasterly direction and is the continuation of the Appalachians. This system appears here only in somewhat isolated heights which, while preserving the continuity of the Appalachians, can scarcely be called a mountain range. The height of this divide varies from 2000 feet above sea level on the west, where it enters the State, to 600 feet at its eastern extremity, where it dies away in the Aroostook region on the border of New Brunswick. The most prominent peak is Mount Katahdin, 5200 feet high. Nearer the west border stand Mount Abraham, 3388 feet, and Mount Bigelow, 3600 feet.

This fringelike coast, with its tasseled edge of bold promontories and rocky islands, has given rise to the appropriate appellation of "hundred-harbored Maine." Although less than 200 miles long, measured in a straight line, such are its sinuosities that it presents a seaboard frontier of nearly 3000 miles. The fiord-like harbors are the result of the drowning of the river valleys scored out by glacial action and extending seaward far beyond the present shore line. This has provided Maine with excellent natural harbors, perfectly protected by the islands, but suffering from a serious disadvantage in the great rise and fall of the tides and the resulting swift currents. At Portland the tide rises 11 feet, increasing eastward. Yet in spite of this disadvantage the coast between Portland and Eastport contains proportionately the greatest number of good harbors to be found anywhere along the coast of the United States.

There are upward of 1600 lakes and ponds, aggregating a total area of over 3145 square miles, or one-eleventh the total area of the State. They lie for the most part in the elevated plateau region and are of great natural beauty. The most noted are: Moosehead Lake, 120 square miles in extent, the largest inland body of water in New England and the source of the Kennebec River; the Rangeley Lakes, with an area of 90 square miles, the headwaters of the Androscoggin River; Chamberlin Lake, supplying the St. John; and Chesuncook Lake, connected with the Penobscot River.

More than 6000 streams lace the surface of the State, with waters of unusual purity. The largest rivers of Maine are naturally those of the south slope. The chief of these are the Saco, Androscoggin, Kennebec, Penobscot, Union, and St. Croix, the last named on the east boundary. The St. John River traverses the northwest corner of the State and forms part of the boundary with New Brunswick. They are of little value for commerce, being navigable only a few miles inland—the Kennebec 26 miles to Augusta; the Penobscot 27 miles to Bangor. They rise at high elevations, and their precipitous character offers the explanation of their value as sources of water power. The power available for industrial purposes is enormous, the Androscoggin alone having developed over 70,000 horse power. Besides, the lakes in connection with these rivers furnish reservoirs for the storage of water, and thus make possible a uniform and constant supply of power through all the year. It is estimated that about 2,000,000 horse power is available. This is utilized especially at the falls which characterize most of the rivers, and which are due to the tilting and folding of the extremely indurated sedimentary strata alternating with unyielding granite beds that cross their path.

Geology. Maine has had a very complex geological history. In pre-Cambrian time the



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St. Joseph
Tring Jc.
St. Francois
Chaudière R.
Lake St. Francis
L. Megantic
Q U E B E C
P R O V I N C E O F
C A N A D A
N E W B R U N S W I C K
FREDERICTON
Edmundston
Madawaska
Grand Isle
Fort Kent
St. Agatha
St. Francis
Allegash
Van Buren
Hamlin
Grand Falls
Stockholm
Jemtland
New Sweden
Caribou
Limestone
Washburn
Presque Isle
Mapleton
Ashland
Haystack Mt.
Masardis
Mars Hill
Bridgewater Cen.
Oxbow
Houlton
Hodgdon
Linneus
Island Falls
Patten
Sherman
Sherman Mills
Mattawamkeag L.
Monticello
Littleton
Woodstock
Hartland
Bristol
Andover
Aroostook Jc.
Tobique R.
Miramichi R.
Nashwaak R.
St. John R.
Canterbury Sta.
Grand Lake
Forest City
Danforth
Kingman
Mattawamkeag
Millinocket
Mt. Katahdin
Chesuncook L.
Chamberlain L.
Churchill L.
Allagash L.
Moosehead Lake
Kineo
Greenville
Jackman
Moose River
Bald Mt.
Lily Bay
Kokadjo
Katahdin Iron Works
Brownville
Penobscot R.
Aroostook R.
Allagash R.
Fish River L.
Eagle Lake
Square L.
Long L.
Musquacook L.
Munsungun L.
Millinocket L.
Telos L.
Scraggly L.
Mattagamon L.
A R O O S T O O K
P I S C A T A Q U I S
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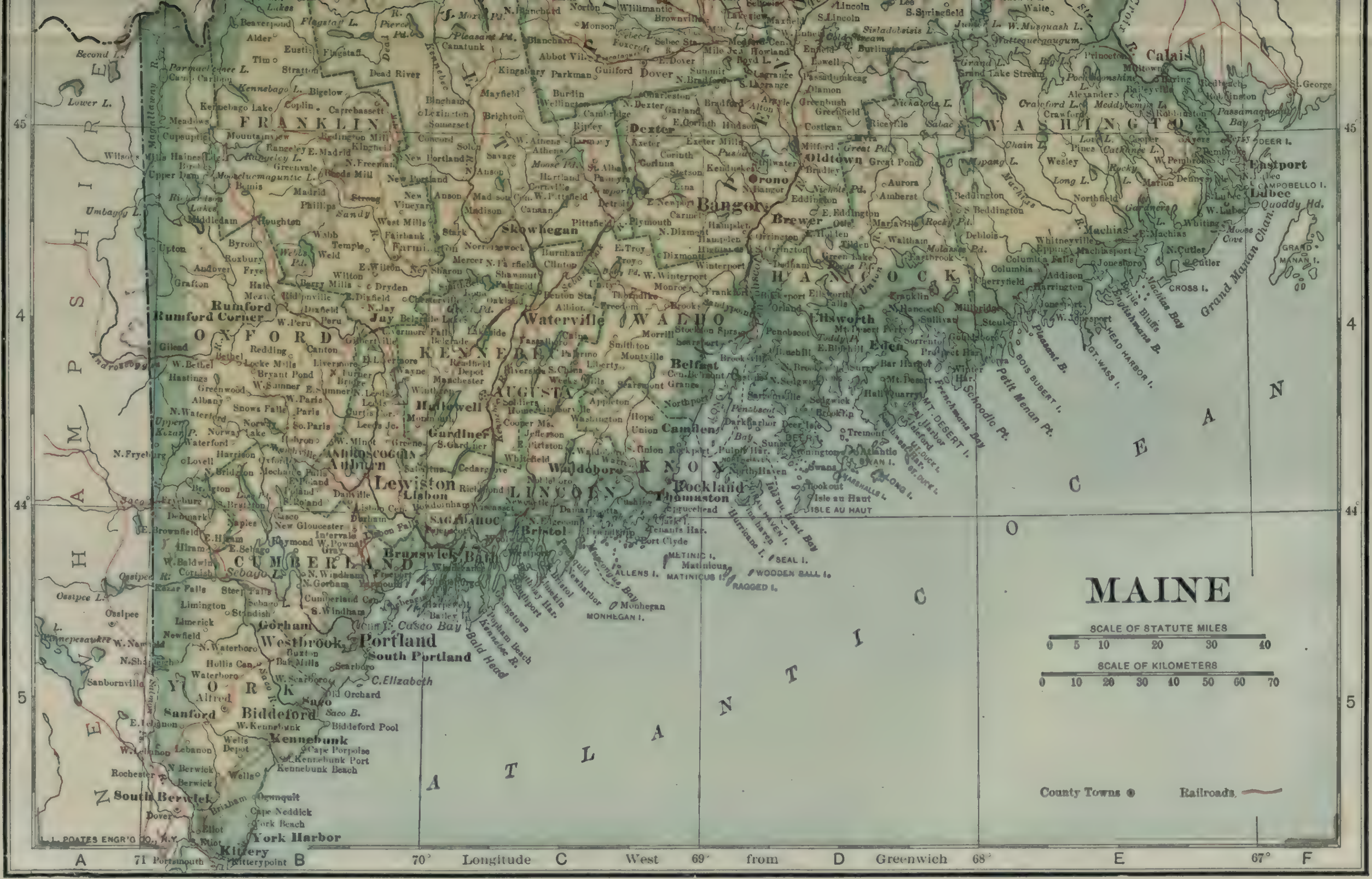
MAINE
SCALE OF STATUTE MILES
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County Towns ●
Railroads
ATLANTIC OCEAN
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WALDO
HANCOCK
WASHINGTON
NEW HAMPSHIRE
Calais
Eastport
Lubec
Machias
Ellsworth
Bangor
Brewer
Orono
Oldtown
Dexter
Dover
Skowhegan
Waterville
Augusta
Hallowell
Gardiner
Belfast
Camden
Rockland
Thomaston
Waldoboro
Wiscasset
Bath
Brunswick
Lewiston
Auburn
Lisbon
Rumford
Rumford Corner
Farmington
Portland
South Portland
Westbrook
Gorham
Saco
Biddeford
Kennebunk
Sanford
Alfred
South Berwick
Kittery
York Harbor
Casco Bay
Penobscot Bay
Muscongus Bay
Frenchmans Bay
Machias Bay
Passamaquoddy Bay
Grand Manan Chan.
MT. DESERT I.
ISLE AU HAUT
MONHEGAN I.
MATINICUS I.
GRAND MANAN I.
CAMPOBELLO I.
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71 70° Longitude West 69° from Greenwich 68° 67°
L. L. POATES ENGR'G CO., N.Y.

State was crossed by two great mountain ranges. One extended along the northwest boundary through the White Mountains to Long Island Sound east of the Connecticut River; the other extended northeast, along the coast. These mountains were much folded, largely gneissic and schistose, and they were worn down to base level in later Paleozoic time. Through the centre of the State, between these two ranges, a long gulf extended from Gaspé peninsula to the southwest. By the end of Devonian time this trough was filled with sediments from the aging mountains, only to be uplifted, crumpled, and somewhat metamorphosed, again worn to base level and depressed, allowing Carboniferous deposits to be laid down unconformably upon all the older beds. It was uplifted and again worn to base level in Cretaceous time, since which the region has been broadly lifted into a plateau of low elevation and again dissected. The Pleistocene ice sheet covered the State entirely, discharging its marginal ice into the sea. The effect of glaciation was to denude the higher lands, accentuate the river valleys, create many lake basins, and leave the surface strewn with a coating of till. Since Pleistocene time there has been a considerable subsidence, resulting in the submergence of the coastal lowlands and converting the higher hills and ridges into a fringe of islands and the drowned valleys into fiords. The latest crustal movement has been a very slight uplift along the coast, uncovering small plains of marine clays which interlock with the rocky headlands. This same slight uplift has revived the rivers, furnishing very valuable water power at the bay heads.

Climate. Maine lies in the heart of the temperate zone, being practically bisected by the forty-fifth parallel of north latitude; yet in climate it ranks as boreal in the northwestern part, and the southeastern part is only a region of transition into the austral zone—a region of overlapping floras and faunas. The winter is very severe, except in a narrow strip along the coast. The summers are never hot. The mean temperature for January is 20° F. in the south and 10° F. in the north. In July the mean temperature is 65° F. in the north and 70° F. in the south. There is a wide range of temperatures through the year, the average maximum shade temperature of 90° F. occurring all along the coast to Eastport. The anticyclones and north winds of winter bring an average minimum of 20° F. below zero to Eastport and Augusta, while the vicinity of Mount Katahdin records an average minimum of 30° below zero. The weather is subject to sudden falls in temperature in short periods because of the frequent passage of cyclonic and anticyclonic centres and the subjection of the State to alternate oceanic and continental influences. The southern counties have a growing season of less than six months, and the northern counties of only about five months. The average annual rainfall for the whole State is 40 inches, very evenly distributed throughout the year, though there is a maximum precipitation in the late summer and autumn. There is an average annual snowfall at the coast of 60 inches, increasing rapidly to the north and west to over 110 inches. The relative humidity for the whole State is above 70 per cent, though the absolute humidity is rather low, on account of low temperatures. The normal wind direction for January is northwest, and for July is southwest. The State lies in the zone of maximum cyclonic frequency.

The cool summers, the lakes, the forests, and the rocky seaside attract multitudes of summer tourists.

The coast and lakes are lined with summer cottages.

Some of the resorts, notably Bar Harbor, on the eastern side of Mount Desert (q.v.), are among the most popular of the American summer resorts.

Soils. The soils of Maine, with the exception of the Pleistocene marine clays along the coast, are almost wholly glacial. A most interesting series of kames traverses its southeastern plateau, having their northerly termini generally along the line of the divide, separating the waters flowing into the Atlantic from those of the northeastern plateau, which discharge into the St. John River basin. The synclinal kame plains between these "horseback" ridges are usually very fertile, especially those of the southeastern counties of Hancock and Washington. Along some of the rivers and lakes and in many old lake bottoms, long since filled up or drained out, there are also alluvial plains of great fertility. The higher outcrops of the crystalline old land are largely denuded of all soil, while the whole surface of the State is more or less strewn with glacial débris. The drift is in places arable, though in wide areas it is unsuited for agriculture. The character of the soil and the large supply and even distribution of rainfall have been determining factors in making the State a rich forest region.

Mining. Maine has little distinction as a mineral-producing State. Granite, the principal product, contributes one-half of the total mineral production. The quarries from which much of the stone is cut are directly on the coast. This lessens the cost of stone at the shipping point and enables it to be sold for a comparatively low price. In 1913 the total value of granite of all kinds produced was $1,790,279. Of this total the building stone produced was valued at $841,168 and the monumental stone at $56,413. The residue was made up of paving, crushed stone, curbing, and flagging. Maine ranks third in the production of granite among the States, Vermont and Massachusetts ranking first and second respectively. Another important stone product is slate, in the production of which Maine ranks third. In 1913 the value of the output was $323,998, entirely quarried in Piscataquis County. There is also a considerable production of limestone, most of which, exclusive of that burned for lime in the State, is used by paper manufacturers. The value of lime produced in 1913 was $906,604. The crystalline rocks produce many rare minerals, one of which, tourmaline, is obtained in Oxford County in larger and more beautiful crystals than anywhere else in the world. Maine leads in the production of feldspar, the value of which in 1913 was $347,499. The mineral waters are of national repute, of which in 1913 there were sold 1,174,262 gallons. Clay, sand, and gravel are also produced in commercial quantities. The total value of the mineral products in 1913 was $4,429,584.

Agriculture. The rugged and broken surface of Maine, characteristic of the New England States, does not admit of extensive agricultural development. For the most part the soil is sterile, though in the river valleys, particularly that of the Aroostook River, the soil is very fertile. This section is devoted almost entirely to the raising of potatoes of such superior quality that most of the product is used for seed both in America and abroad. In 1910, 6,296,850 acres out of a total land area of 19,132,800 acres were in farms, of which there numbered 60,016. In that year there were 2,360,657 acres in improved land in farms, and the average acreage per farm was 104.9. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was $199,271,998 in 1910. The average value of all property per farm was $3,320 in 1910, while the average value of land per acre was $13.73.

Of the total number of farms in 1910 (60,016), 57,453 were operated by owners and managers and 2563 by tenants. It will be noted from this that the percentage of farms operated by tenants is unusually small. Of the total farm operators in 1910, 55,014 were native whites, while 4973 were foreign-born whites and 29 were negroes and other nonwhites. Of the foreign-born white farmers, 3628 were born in Canada.

The following table shows the acreage, value, and production of the principal crops in 1914 as estimated by the United States Department of Agriculture.

PRODUCT	Acreage	Prod. bu.	Value
Corn	16,000	736,000	$648,000
Wheat	3,000	81,000	88,000
Oats	141,000	5,781,000	3,295,000
Barley	5,000	150,000	122,000
Buckwheat	12,000	348,000	209,000
Potatoes	130,000	33,300,000	11,154,000
Hay	1,230,000	* 1,414,000	18,523,000

* Tons.

The general character of agriculture is indicated by the fact that in 1909 only 7.9 per cent of the total value of crops was contributed by cereals, while nearly two-fifths was contributed by hay and forage and nearly one-third by potatoes and other vegetables. The total value of crops in 1909 was $39,318,000. The leading crops, judged by value, are hay and forage, potatoes, oats, and corn. As elsewhere in New England, the influence of Western competition has obliged Maine farmers to give up cereal farming in a large measure. Oats is the principal cereal grown. In 1909 over one-half the total acreage of potatoes was in Aroostook County. Of the potatoes commercially grown, the greater quantity is produced in Aroostook and Penobscot counties. In the production of potatoes improved methods are used, so that the yield per acre is the highest of all the States. In 1909 it was 210.3 bushels, while in 1914 the estimated yield per acre was 260 bushels, which was about 92 more than its nearest competitor, Vermont.

In 1909 the total acreage of potatoes and other vegetables was 161,087, and their value was $12,378,000. Excluding potatoes, the acreage of vegetables was 25,288, and the value $2,153,000. Many parts of the State are well adapted to the growing of orchard fruits, especially apples. There were produced, in 1909, 3,636,181 bushels of apples, valued at $2,121,816. Other fruits produced in smaller quantities are pears, cherries, plums, and prunes. The most important of the small fruits is the strawberry, of which 1,626,250 quarts, valued at $168,847, were produced in 1909.

Live Stock and Dairy Products. Stock raising is not a leading industry, but some of the horses raised are of superior quality and are in great demand for breeding and other purposes. The total value of all live stock on farms in 1910 was $23,989,560. The estimated number of animals on the farms on Jan. 1, 1915, was as follows: cattle, other than milch cows, 101,000, valued at $2,636,000; milch cows, 157,000, valued at $8,478,000; horses, 113,000, valued at $16,498,000; sheep, 165,000, valued at $741,000; swine, 95,000, valued at $1,492,000. The dairy cows on April 15, 1910, numbered 156,819. The milk produced in 1909 was 56,026,334 gallons. From this was made 13,299,229 pounds of butter, valued at $3,786,054. The total value of milk, cream, butter fat, butter, and cheese made in 1909 was $8,079,692. The total number of fowls of all kinds in 1910 was 1,735,962, valued at $1,131,921.

Fisheries. The State ranks second among the New England States in the value of its fisheries and first in the number of men engaged in the fishing industry. Of all fishery products, the most important in point of value is lobster, this being more important in Maine than in all the other New England States combined. In 1908, the latest year for which complete statistics are available, 9,929,200 pounds of lobster, valued at $1,269,450, were taken. Next in point of value was cod, of which 20,010,800 pounds, valued at $438,880, were caught. Herring, the third fish in point of value, was taken to the amount of 92,985,200 pounds, valued at $419,980. Herring fishing is more important here than in any other New England State. In several of the rivers salmon of unusual quality is taken, and the salmon fishery, although comparatively small, is the largest on the Atlantic coast. Other fish taken in large quantities are haddock, clams, scallops, hake, pollock, and swordfish. The canning of small herring as sardines is an important industry, especially at Eastport, and the preparation of smoked herring is of considerable importance. The total value of the fisheries for the year ending Dec. 31, 1908, was $3,256,580. There were 5004 independent fishermen engaged, with 1857 employees. The number of vessels employed was 576, valued at $817,463.

Forest Products. Maine was for many years one of the leading States of the Union in the extent of wooded area and the annual value received from the forest products. There still remain large areas of wooded land which are practically untouched. The forests cover largely the interior and northern portions, the coast and lower valleys being generally cleared. The land rapidly reforests, and since most of it is not well suited to cultivation, reforestation is extensive. The primeval forests of white pine which gave the State the name of Pine Tree State have nearly all disappeared, but the second growth is being used to a large extent. Spruce forests are the most extensive.

The relative abundance of different trees in Maine at the present time is indicated roughly by some statistics from the Thirteenth Census. In 1909 there were 1243 saw mills in the State, with the following production of lumber, laths, and shingles in M feet, B. M.: spruce, 421,297; white pine, 383,551; hemlock, 109,581; birch, 62,812; balsam fir, 50,491; oak, 18,554; maple, 16,714; cedar (mostly arbor vitæ), 15,140; yellow pine (mostly pitch pine), 13,474; beech, 9638; basswood, 4123; ash, 2572; cottonwood, 2012; elm, 910; tamarack, 420; all others, 276. Total conifers, 993,954; total hardwoods, 117,611; grand total, 1,111,565, valued at $18,913,678. Lath amounted to 337,086 thousands, and the shingles to 598,131 thousands. In 1909 Maine ranked first among the States in its cut of spruce. It was also first in the cut of white pine.

In the same year there were used for pulp wood by Maine paper mills 552,032 cords of spruce grown within the State, 119,550 cords of poplar (aspen), 10,954 of hemlock, 1615 of balsam, 781 of pine, and 341 of other woods. For details of the use of the forests in the manufacture of wood pulp and paper, see the section on *Manufactures* below.

In addition to the statistics of forest products given above, there were produced in 1909, on the farms of the State, forest and timber products valued at $5,573,763. Of this amount $870,525 were received for standing timber.

Manufactures. Transportation facilities of Maine are good, and important manufacturing centres are accessible by rail, while good harbors and navigable rivers afford excellent means for water transportation. The following table gives the most important data relating to manufactures in 1909 in comparison with 1904.

Five industries greatly predominate in importance. They represent approximately two-thirds of the average number of wage earners, value of products and value added by manufacture. There is a considerable diversity in the manufacturing activities. The manufacture of paper and wood pulp is the leading industry, measured by value of products. In 1909 Maine produced 12.7 per cent of the total value of paper and wood-pulp products for the country. The large forests of pulp wood have resulted in the importance of this industry. To manufacture the wood into pulp and paper, some of the largest mills devoted to these purposes hitherto erected are employed. In 1909 these mills consumed 903,962 cords of pulp wood, or nearly three times the quantity used in 1899. Of this wood, 718,532 cords were spruce, 123,052 were poplar, 10,954 were hemlock, and 2737 were of other species. The quantity of all kinds of paper produced in 1909 was 574,215 tons. The largest quantity of paper is for newspaper purposes. This in 1909 was valued at $11,424,388. Book paper was valued at $8,079,299. The second industry in point of value of products is that related to the manufacture of lumber and timber. For further information in regard to this industry, see the paragraph *Forest Products* above. Textile industries are third, of which the manufacture of cotton and woolen goods is the most

COMPARATIVE SUMMARY FOR 1909 AND 1904 *

THE STATE — ALL INDUSTRIES COMBINED AND SELECTED INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Cost of materials	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands				
All industries	1909	3,546	88,476	79,955	$202,260	$37,632	$97,101	$176,029	$78,928
	1904	3,145	82,109	74,958	143,708	32,692	80,042	144,020	63,978
Agricultural implements	1909	10	147	121	449	78	84	226	142
	1904	13	186	153	394	77	76	206	130
Boots and shoes, including cut stock and findings.	1909	55	7,195	6,626	7,284	3,210	9,941	15,509	5,568
	1904	58	6,363	5,950	4,643	2,673	8,435	12,608	4,173
Boxes, fancy and paper	1909	10	308	280	252	92	125	304	179
	1904	9	237	222	145	70	106	236	130
Bread and other bakery products	1909	186	858	586	661	303	1,428	2,235	807
	1904	151	701	469	497	220	877	1,489	612
Brick and tile	1909	49	330	263	529	150	105	390	285
	1904	66	416	330	599	165	118	420	302
Butter, cheese, and condensed milk	1909	29	138	96	424	48	1,098	1,301	203
	1904	46	123	78	385	47	1,045	1,230	185
Canning and preserving	1909	245	4,410	3,850	5,114	1,138	5,125	7,689	2,564
	1904	235	4,073	3,487	3,432	1,306	4,240	7,267	3,027
Carriages and wagons and materials	1909	150	667	472	1,004	257	397	966	569
	1904	158	659	459	692	247	400	956	556
Cars and general shop construction and repairs by steam-railroad companies.	1909	18	1,256	1,200	1,690	763	1,199	2,048	849
	1904	15	891	863	1,024	458	685	1,190	505
Clothing, men's, including shirts	1909	33	1,148	1,068	690	333	597	1,164	567
	1904	34	1,185	1,090	449	304	407	929	522
Clothing, women's	1909	7	574	532	388	184	338	686	348
	1904	10	512	486	194	121	309	554	245
Confectionery	1909	28	278	214	435	76	336	711	375
	1904	17	236	200	112	59	303	497	194
Cooperage and wooden goods, not elsewhere specified.	1909	68	444	349	870	164	435	842	407
	1904	78	458	354	496	144	291	573	282
Copper, tin, and sheet-iron products	1909	16	452	374	5,513	190	1,018	1,689	671
	1904	12	176	142	245	72	400	509	109

* Table continued on page 686.

COMPARATIVE SUMMARY FOR 1909 AND 1904—*continued*

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Cost of materials	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands				
Cotton goods, including cotton small wares.	1909	16	14,783	14,634	25,653	5,718	11,390	21,932	10,542
	1904	15	12,582	12,382	21,643	4,037	9,173	15,406	6,233
Flour-mill and gristmill products....	1909	173	514	225	1,916	101	4,027	4,507	480
	1904	161	471	234	1,423	108	3,442	3,933	491
Foundry and machine-shop products.	1909	125	3,229	2,885	6,318	1,512	2,344	5,237	2,893
	1904	106	3,294	3,002	5,286	1,518	2,001	4,888	2,887
Furniture and refrigerators.........	1909	13	266	215	355	116	168	368	200
	1904	11	263	237	414	118	145	377	232
Gas, illuminating and heating.......	1909	19	284	216	2,665	120	212	549	337
	1904	15	156	100	2,058	63	129	444	315
Glucose and starch................	1909	64	195	120	890	68	475	687	212
	1904	65	202	107	630	47	364	524	160
Leather goods.....................	1909	17	342	286	738	159	391	675	284
	1904	19	382	325	597	152	291	704	413
Leather, tanned, curried, and finished.	1909	17	466	436	1,729	208	1,452	1,905	453
	1904	27	572	515	1,465	237	1,974	2,500	526
Lime..........................	1909	12	564	526	1,959	197	729	1,215	486
	1904	8	698	663	1,927	297	602	1,174	572
Lumber and timber products........	1909	1,065	17,101	15,086	26,536	7,103	10,930	26,125	15,195
	1904	862	15,307	13,577	17,810	6,155	8,912	21,337	12,425
Marble and stone work...........	1909	142	2,663	2,381	4,280	1,532	490	2,565	2,075
	1904	61	2,691	2,532	3,008	1,514	376	2,555	2,179
Paper and wood pulp.............	1909	45	9,146	8,647	65,133	5,267	20,504	33,950	13,446
	1904	37	7,935	7,574	41,274	4,053	13,868	22,951	9,083
Patent medicines and compounds and druggists' preparations.	1909	37	213	144	725	49	197	756	559
	1904	27	193	147	204	46	158	585	427
Printing and publishing...........	1909	195	2,359	1,651	2,611	779	1,102	3,438	2,336
	1904	217	2,292	1,804	2,177	767	932	3,400	2,468
Shipbuilding, including boat building.	1909	156	2,014	1,755	2,304	992	1,169	3,062	1,893
	1904	138	1,528	1,322	1,222	759	1,715	3,038	1,323
Slaughtering and meat packing......	1909	20	152	107	197	58	785	957	172
	1904	12	190	160	316	85	524	723	199
Stoves and furnaces, including gas and oil stoves.	1909	4	230	190	412	113	98	329	231
	1904	4	232	207	382	118	72	304	232
Tobacco manufactures.............	1909	77	351	252	202	146	169	464	295
	1904	64	327	244	137	123	182	450	268
Wood, turned and carved..........	1909	62	1,424	1,287	2,063	572	899	1,870	971
	1904	58	1,550	1,454	1,722	577	668	1,641	973
Woolen, worsted, and felt goods, and wool hats.	1909	65	9,070	8,754	19,834	3,870	11,362	18,490	7,128
	1904	72	9,062	8,743	17,552	3,514	10,811	17,580	6,769
All other industries...............	1909	318	4,905	4,127	10,437	1,966	5,982	11,188	5,206
	1904	264	5,966	5,346	9,154	2,441	6,011	10,842	4,831

important. The canning and preserving of vegetables, fruits, and fish form also an industry of importance. The total number of cases of corn canned in 1909 was 792,158, valued at $1,320,223. The canned fish amounted to 90,445,752 pounds, valued at $4,812,739. Of these, sardines alone were $4,609,224. The most important of canned fruits are apples, of which 75,540 cases, valued at $122,791, were canned in 1909.

Shipbuilding was once one of the leading industries, but as the building of ships ceased to depend upon forest products and the use of steel in vessel construction increased, the industry declined. A vessel was built in the State as early as 1608, and for a long period Maine held first rank in shipbuilding. At one time there were constructed in the State more than one-half of all the seagoing vessels of the nation. At the present time the industry is carried on chiefly in Bath, once a great centre for the building of wooden ships. That the industry is still of importance is shown by the fact that the value of the product in 1909 was $3,062,000, and that it gave employment to an average of 1755 wage earners.

The wage earners in the factory industries in 1909 were 79,955, of whom 61,420 were males and 18,535 females. The wage earners under 16 years of age numbered 1387, of whom 808 were males. There were no important industries where children under 16 years of age were employed to any considerable extent, with the exception of the cotton mills. The prevailing hours of labor for slightly more than one-half of the wage earners in 1909 were 60 hours a week. This high proportion has resulted chiefly from the more or less general prevalence of the 60-hour week in the cotton and woolen mills and the lumber and canning industries.

There were in 1909 seven cities having a population of over 10,000. These contained 22.4 per cent of the total population and produced 29.2 per cent of the total value of manufactured products. Several of the more important industries, including the manufacture of woolen goods, are carried on chiefly outside of this class of cities. The most important cities and the value of products in 1909 were: Portland, $11,950,367; Lewiston, $10,475,374; Biddeford, $9,001,606; and Auburn, $8,842,629, with 4902, 6788, 5076, and 3452 wage earners respectively. Other cities having a value of product of $3,000,000 or over were Augusta, Bangor, and Waterville. Lewiston and Biddeford owe their importance to the manufacture of cotton goods, and in Auburn the manufacture of boots and shoes is the principal industry. The industries of Portland are diversified and include lumber and timber products, foundry and machine-shop products, and the printing and publishing industry. Further information in regard to these cities will be found under their separate titles in other portions of this work.

Transportation. Portland has one of the best harbors on the North Atlantic coast and is an important seaport for domestic and foreign shipping. Maine is the only one of the New England States in which there was a large railroad construction in the last decade of the nineteenth century. This was chiefly due to the building of the Bangor and Aroostook Railroad, running from Bangor into the northeastern counties. The total steam-railroad mileage in 1913 was 2301. The longest railroads are the Maine Central, with a mileage of 992; the Bangor and Aroostook, 630; the Canadian Pacific, 177; the Boston and Maine, 139; and the Sandy River and Rangeley Lakes Railroad, 105. The building of street and suburban railways has been rapid. The total mileage of electric railways in 1913 was 492. The longest of these is the Lewiston, Augusta, and Waterville Street Railway, with a mileage of 139. Lines of steamships sail regularly between the largest cities of the State and Boston, also between Portland and New York, St. John, N. B., and Halifax.

Banks. On Sept. 12, 1914, there were 69 national banks with loans aggregating $39,391,467; cash, etc., $650,895; capital, $7,740,000; and deposits, $51,650,375. There were, on June 30, 1914, $95,222,151 deposited in 48 savings banks, credited to 236,279 depositors. There were also 45 loan and trust companies with loans of $32,776,909 and deposits of $48,485,526.

Government. The present constitution was adopted in 1819. Two-thirds of both Houses of the Legislature concurring, a proposed amendment to the constitution is submitted to the people in the form of a resolution. This is voted upon on the second Monday in September following its passage, and if a majority of the voters are in favor, the amendment becomes part of the constitution.

Legislative.—The legislative power is vested in a Senate and a House of Representatives. The House of Representatives consists of 151 members, elected by the qualified electors for two years. The Senate consists of not less than 20 nor more than 31 members, elected at the same time and for the same term as the Representatives. The Senate has the sole power to try impeachments. The Legislature convenes on the first Wednesday of January biennially.

Executive.—The supreme executive power is vested in the Governor, who is elected biennially by a plurality vote. A council of seven persons is elected biennially by joint ballot of both Houses of the Legislature, to advise and assist the Governor, but not more than one councilor can be chosen from any senatorial district. A Secretary of State and a Treasurer are also chosen by joint ballot of both Houses at the first session of the Legislature. Each serves for two years, but the Treasurer is not eligible for more than six years' successive service.

Judiciary.—Judicial power is vested in a supreme court and such other courts as the Legislature may, from time to time, establish. Judges and registers of probate are elected by the people of their respective counties by a plurality vote at the annual election. Judges of municipal and police courts are appointed by the executive power in the same manner as other judicial officers and hold office for four years. An Attorney-General is chosen biennially by the Legislature on joint ballot.

Suffrage and Elections.—Every male citizen of the United States of the age of 21 years and upward, excepting paupers, persons under guardianship, and Indians not taxed, having a residence established in the State for a term of three months next preceding any election, is an elector for Governor, Senators, and Representatives; but no person has the right to vote or be eligible for office who shall not be able to read the constitution in the English language and write his name, except any person prevented by physical disability from complying with these requirements, or any person who had a right to vote in 1891 at the time of the adoption of the amendment providing for an educational qualification. Governors, Senators, and Representatives in the Legislature are elected biennially, dating from 1880. In 1907 the constitution was amended to provide for a people's veto through the optional referendum and a direct initiative by petition and at general or special elections. The Legislature of 1911 enacted a direct primary law, but this was superseded as the result of a special election held on September 11 of that year, at which a measure known as the Davies Direct Primaries Elections Law was voted upon in referendum. The Davies law applies to all candidates for congressional, State, and county offices. The measure also included a stringent corrupt-practices provision, determining not only the amount of money which shall be expended by candidates for public office, but also the methods by which it shall be expended.

Local and Municipal Government.—The State is divided into 16 counties, and these into districts, towns, and plantations. Towns not incorporated as cities are governed by boards of selectmen elected at annual town meetings. At the same meetings are passed such provisions and measures for local government as are necessary. Cities and towns have the right to adopt a commission form of government. The first charter providing for this method of government was adopted by the city of Gardiner on Sept. 11, 1911. At the end of 1913 this was the only city in the State which had adopted a commission form of government.

Other Constitutional and Statutory Provisions.—In 1884 an amendment prohibiting the manufacture and sale of intoxicating liquors was adopted by the people and became a part of the constitution in January, 1885. In 1905 there was passed what is known as the Sturgis law. This created an enforcement commission of three, to be appointed by the Governor, and gave them the power of sheriffs to enforce the liquor laws. Husbands are not liable for debts contracted by their wives in their own name, but the latter may be sued for them. A wife may hold real estate and personal estate separately from her husband and may convey or devise the same by will. The employment of children under 14 years of age in manufacturing or mechanical establishments is forbidden. Hunting by unnaturalized foreign-born persons is forbidden. Corporations are required to pay an annual franchise tax of from $5 to $75 in accordance with the amount of capital investment. There is a 58-hour law for women and children in all cotton mills and other factories, except sardine factories and corn shops. The Legislature of 1909 created a State board of arbitration for labor disputes. The Legislature of 1911 created a department of labor and industry. In 1913 the Legislature passed an antitrust act and a public-utilities act, patterned after the Wisconsin statute.

Finance. At the beginning of the fiscal year 1913 there was in the Treasury a balance of $649,303. The total valuation of the State in 1913 was $478,156,044, and the State tax was $2,392,936. The chief expenditures are for education, government officers, and charities and corrections. There is an inheritance tax law which was amended in 1911. There is also taxation of express companies, steam railroads, insurance companies, telephone and telegraph companies, and foreign corporations. The funded debt of the State on Jan. 1, 1913, consisted of one series of negotiable bonds and of several public-debt obligations to public trust funds. The total bonded indebtedness on Jan. 1, 1914, was $569,000. The per capita debt showed a decrease of $8.49 in 1880 to $1.67 in 1912.

Militia. In 1910 there were 151,325 males of militia age. In 1914 the organized force numbered 1512 men, consisting of 108 officers and 1404 enlisted men.

Population. The population of the State at different periods is shown by the following figures: 1790, 96,540; 1810, 228,705; 1830, 399,455; 1850, 583,169; 1860, 628,279; 1870, 626,915; 1880, 648,936; 1890, 661,086; 1900, 694,466; 1910, 742,371. Population on July 1, 1914, was 762,787; 1920, 768,014. The State ranked thirty-fourth in population in 1910. The urban population, including places of 2500 or more, in 1910 was 381,443. There were in that year 1363 negroes. There has been a large immigration of French from Canada, and these congregate for the most part in industrial centres. The total number of native whites of foreign or mixed parentage in 1910 was 134,955. The foreign-born whites numbered 110,133. Of the foreign-born whites, 35,013 were French Canadians and 40,905 were Canadians of native birth. In the extreme northeastern part of the State there are extensive sections in which the population is almost entirely French. These are descended from the French inhabitants of Nova Scotia, who were driven from their homes by the English. There is also a settlement of Swedes in Aroostook County, which for many years has formed a prosperous community known as New Sweden. By sex the population was divided in 1910 into 377,052 males and 365,319 females. The males of voting age numbered 235,727. The largest city is Portland, with a population in 1910 of 58,571. The other large cities, with their populations in 1910, are as follows: Lewiston, 26,247; Bangor, 24,803; Auburn, 15,064; Biddeford, 17,079; Augusta, 13,211; Waterville, 11,458; Bath, 9396.

Education. In 1910 the percentage of illiteracy for all persons of 10 years of age and over was 4.1; among those of native parentage it was 1.4. The total school population (6 to 20 years of age) was 221,271 in 1914, while the enrollment was 146,620, and of these 113,056 attended school. The number of teachers in the elementary schools in 1913 was 6938, and in the secondary schools 670. The average yearly salary of male teachers in the elementary schools was $465.99, and of female teachers $345.93. In the secondary schools the average yearly salary of male teachers was $947.40, and of female teachers $558.08.

Standards of education in Maine have always been high. In 1821 a law was passed requiring every town and plantation to raise and expend not less than 40 cents per inhabitant for school purposes. In 1828 there were set aside by law 20 townships of public land for the establishment of a public-school fund. Prior to 1873 a large number of academies flourished, but in that year provision was made in the Legislature for State aid to towns which maintained schools for free academic instruction. In 1889 towns were authorized to contract with any academy or high school for the tuition of their scholars and to receive the same aid from the State as if they had established a free high school within the town. Town management has taken the place of the district plan of school supervision, and there is a strictly enforced compulsory-attendance law covering the ages from 7 to 15 inclusive. The average elementary school year is 163 school days. In a group of towns in the most northern part of the State, comprising what is known as the Madawaska Territory, is found a peculiar educational situation. The people in this section are descendants of the Acadian exiles who settled in the upper St. John River valley. Since the French language was the universal language of the people, there arose the question of providing for them adequate educational facilities. By an Act of the Legislature of 1863 the towns of Madawaska Territory were given liberal conditions of State aid, with the provision that instruction in all the schools should be given in the English language. No teachers were to be found within the territory who were available for service in the schools. This condition led to the establishment of a Madawaska Training School at Fort Kent, the chief function of which was to be the training of teachers for the common schools of the territory. So well has the school performed the service for which it was established that the English language is now generally spoken and understood among the people. The total enrollment in the secondary schools on July 1, 1912, was 16,467. The total number of free schools receiving State aid in 1912 was 182, and the number of towns maintaining free high schools was 177. There were, in the same year, 49 academies with 4244 students. The total expenditures for public schools in 1912 was $3,151,917.

The Legislature of 1913 passed Acts providing for State certification of all teachers of public schools and for increasing the efficiency of the public schools by retiring teachers of long service with pensions. Provision was also made for better enforcement of child-labor laws and for extension of industrial educational work. The normal schools are Western Normal School at Gorham, Washington State Normal School at Machias, Farmington Normal School at Farmington, Castine Normal School at Castine, Aroostook State Normal School at Presque Isle, and Madawaska Training School at Fort Kent. The institutions for higher education include the University of Maine (see MAINE, UNIVERSITY OF) at Orono, Bowdoin College (q.v.) at Brunswick, Colby College (q.v.) at Waterville, and Bates College (q.v.) at Lewiston. The University of Maine is a State institution, and since the beginning of 1912 admits students from any standard school of the State upon the record of satisfactory completion of subjects required for admission.

Charities and Corrections. The Legislature of 1913 created a State board whose duty is to investigate and inspect the whole system of public charities and correctional institutions and examine into the condition and management of prisons, jails, reform schools, industrial schools of a charitable or correctional nature, etc. The charitable institutions under the control of this body include the Augusta State Hospital, the Bangor State Hospital, the Maine School for the Feeble-Minded at West Pownal, and the Bath Military and Naval Orphan Asylum. The child-saving institutions include the Maine Children's Home Society at Augusta, the Eastern Maine Orphans Home at Bangor, the Children's Aid Society of Maine at Belfast, the Healy Asylum for Boys and the Lewiston and Auburn Children's Home at Lewiston, the Maine Home for Friendless Boys and the Temporary Home for Women and Children at Portland. The correctional institutions include the Maine Industrial School for Girls at Hallowell, the State School for Boys at South Portland, and the Maine State Prison at Thomaston. There are in addition many private charitable institutions in the larger cities. The expenditures for all the institutions in the care of the State in 1913 was $1,102,177. In the child-saving institutions in 1913 there were 962 children. The total number of persons cared for by the correctional institutions in 1913 was 1226. The wife or guardian of the children of any prisoner convicted of desertion and employed at hard labor receives from the State 50 cents a day for the labor of the convict.

Religion. The immigration into the State during recent years, including the large number of French Canadians, has increased the Roman Catholic population until the Roman Catholic communicants number over one-third of the total Church membership. The strongest Protestant denominations in their order are the Baptists, Methodists, and Congregationalists.

History. Maine attracted the interest of explorers early in the sixteenth century. Giovanni da Verrazano sailed down the coast in 1524, Estevan Gómez followed him in 1525, and before the middle of the sixteenth century more than one navigator had sailed up the Penobscot River in search of splendid Norumbega (q.v.), with its columns of crystal and silver. In 1580 John Walker, sailing in the employ of Sir Humphrey Gilbert, led an expedition to Maine, but with no results. The voyages of Gosnold (1602), Pring (1603), and Weymouth (1605) were followed by that of John Smith (1614), who left an account of the country in his *Description of New England.* In 1604 a French expedition under De Monts (see MONTS) planted upon Neutral Island, in the St. Croix River, a colony which was abandoned in the following year. Maine fell within the limits of the grant made to the Plymouth Company by James I in 1606, and in the following year an English expedition sent out by Sir John Popham and Sir Ferdinando Gorges effected a settlement at Sabino Point, at the mouth of the Sagadahoc or Kennebec River. In 1608 the settlement was abandoned, and most of the colonists returned to England. French Jesuits landed on Mount Desert as early as 1608, and in 1613 they were joined by a number of fishermen; but Captain Argall (q.v.) broke up the colony within a short time. In 1622 Sir Ferdinando Gorges and Captain John Mason received from the Council for New England a grant of the territory between the Merrimac and the Kennebec rivers extending for 60 miles inland. The proprietors divided their possessions, the former taking the land east of the Piscataqua River. A colony of fishermen settled on Monhegan Island in 1623, but disappeared three years later. The first permanent settlement in Maine was made at Pemaquid in 1625–26; Agamenticum (York) was founded about the same time, and after 1630 Saco, Biddeford, Port Elizabeth, Portland, and Scarborough sprang up in rapid succession. In 1639 Gorges received a large accession of territory and was confirmed in his old possessions with the title of Lord Palatine, and established a provincial government at York. Before this time the Council for New England had issued many patents covering lands already granted to Gorges, and in the disputes that followed Massachusetts was called in as arbitrator. Taking advantage of the civil war that was then raging in England, the Massachusetts government proceeded to bring Maine under its own authority. In 1652 it annexed all the towns as far east as Casco, basing its right on its charter, which granted it all lands 3 miles north of the source of the Merrimac. By 1660 all Maine west of the Penobscot was reduced, and it was retained in spite of royal orders from Charles II and a grant made in 1664 to the Duke of York of all the territory between Pemaquid and the St. Croix. In 1677 the claims of the Gorges heirs were bought by Massachusetts, and by the charter of 1691 Massachusetts was confirmed in possession of the territory. East of the Penobscot the French held the land and assiduously stirred up the Indian tribes against the English. In 1675 an outbreak of the Tarentine tribe marked the beginning of a long struggle in which most of the towns on the coast east of the Piscataqua were laid waste. The country suffered greatly, too, in the French and Indian wars. During King William's reign the inhabitants of Cocheco were massacred by the Penacook Indians, Pemaquid was taken, and the settlements east of Falmouth were abandoned. From 1722 to 1725 the tribes of Nova Scotia and eastern Maine waged a fierce warfare against the colonists, and security was not really established till the Treaty of Paris in 1763. During the Revolution Maine was active in the patriot cause. At the end of the war Massachusetts retained possession of the territory, exercising jurisdiction over it as the District of Maine. Disputes with the mother State were frequent, and between 1783 and 1791 steps towards independence were taken. The tendency towards separation was hastened by the fact that the inhabitants of Maine were Democratic in their political sympathies and tolerated with difficulty the rule of Federalist Massachusetts. In the War of 1812 Maine was left ill defended by Massachusetts, and its territory east of the Penobscot was occupied by the British. After the war the separatist movement grew rapidly. Probably, however, the desire for separation from Massachusetts would not have been so quickly realized if the struggle over the admission of Missouri into the Union had not brought about the necessity of admitting a Northern State to preserve the balance of power. On March 15, 1820, Maine became a State. Industry and commerce received a great impetus after the War of 1812, but throughout the nineteenth century the increase in wealth and population was rather steady than swift. The dispute with England concerning the northeastern boundary of the State was the cause of constant quarrels between the inhabitants of Maine and New Brunswick. The officials sent out by both to take possession of the disputed lands on the St. Croix River came into collision, and hostilities were prevented only by the signing of the Webster-Ashburton Treaty (q.v.) in 1842. The only important subject of legislation in the State of other than local interest has been that of prohibition. After some tentative lawmaking a stringent prohibitory law, passed in 1858, was incorporated into the constitution in 1884 and has remained in force ever since. Many minor regulations looking towards the effectual execution of the prohibitory law have been passed at frequent intervals, but prohibition on the whole has not turned out entirely successful, and evasions of the law are frequent. Before 1856 Maine was generally Democratic in State elections and only once (1840) voted against the Democratic candidate in presidential elections. From 1856 to 1880 it was emphatically Republican, except in the year 1878, when the Democrats and Greenback party in fusion succeeded in electing their candidate for Governor. The Governor chosen in 1878 was Alonzo Garcelon. In 1879 an election for members of the Legislature took place, and Governor Garcelon, desirous of gaining the Legislature for the fusion party, seized every opportunity afforded by the irregular but time-honored way in which elections were conducted to refuse certificates to Republican candidates and seat Democrats in their place; a Democratic majority was thus secured, and the Legislature was organized. The Republicans organized a rival body and proceeded to elect a Governor, since no candidate had received a majority at the polls. Peace was preserved by the militia until a decision of the Supreme Court established the legality of the Republican Legislature. In 1891 the Australian ballot law was passed. The Legislature in 1907 passed a measure repealing the Sturgis law providing for the strict enforcement of prohibition. This was vetoed by Governor Cobb. The State elections in 1908, held on the issue of prohibition, resulted in a victory for Bert M. Fernald, Republican, who favored the strict enforcement of the law. In 1910, however, the conditions were reversed, when Frederick W. Plaisted, the Democratic candidate, defeated his Republican opponent, thus giving the State to the Democrats for the first time since 1882. Mr. Plaisted and the Legislature were pledged to resubmit to the people the question of prohibition. On March 2, 1911, the Legislature passed a measure submitting the question of repeal of the prohibition amendment to the people. This was followed by the most bitter and aggressive campaign in the history of the State, and on September 11 the amendment was defeated by a vote of 60,853 against 60,095. All the cities in the State, with one exception, voted for the repeal of the law. This ended the effort to bring about the repeal of the prohibition of the State.

Before 1910 Maine was considered a strong Republican State. In the election on Nov. 3, 1908, Taft received 67,120 votes and Bryan 35,880. As noted above, however, the Democrats, largely as a result of local issues, were able in 1910 to elect a Governor and a Legislature. This then enabled the Democrats to elect a United States Senator to succeed Eugene Hale, who was not a candidate for reëlection, and on January 17 Charles F. Johnson was elected. The death of Senator Frye on Aug. 8, 1911, was followed by the appointment of Obadiah Gardner to fill out his unexpired term. This gave the State two Democratic Senators for the first time since the Civil War. In the election of 1911 a direct primary law for all State and county officers and United States Senators was adopted, as was a constitutional amendment making Augusta the permanent capital.

In 1912 the Republicans had so far regained their strength that they were able to elect William T. Haines Governor, defeating Governor Plaisted, who was a candidate for reëlection. In 1912 the State was carried by Wilson, who received 51,113 votes to 48,493 for Roosevelt and 26,545 for Taft. The Legislature elected was composed of a majority of Republican and Progressive votes. The division in the Republican party resulted in the election on Sept. 14, 1914, of Oakley C. Curtis, Democrat, for Governor, defeating William T. Haines, who was a candidate for reëlection.

The following have been Governors of Maine:

William King	Democrat	1820–21
William D. Williamson (acting)	Democrat	1821
Albion K. Parris	Democrat	1822–27
Enoch Lincoln	"	1827–29
Nathan Cutter (acting)	"	1829–30
Jonathan D. Hunton	"	1830–31
Samuel E. Smith	"	1831–34
Robert P. Dunlap	"	1834–38
Edward Kent	Whig	1838–39
John Fairfield	Democrat	1839–40
Edward Kent	Whig	1840–41
John Fairfield	Democrat	1841–43
Edward Kavanagh	"	1843–44
Hugh J. Anderson	"	1844–47
John W. Dana	"	1847–50
John Hubbard	"	1850–53
William G. Crosby	Whig and Free-Soil	1853–55
Anson P. Morrill	Republican	1855–56
Samuel Wells	Democrat	1856–57
Hannibal Hamlin	Republican	1857
Joseph H. Williams (acting)	"	1857–58
Lot M. Morrill	"	1858–60
Israel Washburn	"	1861–63
Abner Coburn	"	1863–64
Samuel Cony	"	1864–67
Joshua L. Chamberlain	"	1867–71
Sidney Perham	"	1871–74
Nelson Dingley	"	1874–76
Selden Connor	"	1876–79
Alonzo Garcelon	Democrat-Greenback	1879–80
Samuel F. Davis	Republican	1880–81
Harris M. Plaisted	Democrat-Greenback	1881–83
Frederick Robie	Republican	1883–87
Joseph R. Bodwell	"	1887
Sebastian S. Marble (acting)	"	1887–89
Edwin C. Burleigh	"	1889–93
Henry B. Cleaves	"	1893–97
Llewellyn Powers	"	1897–1901

John F. Hill	Republican	1901–05
William T. Cobb	"	1905–09
Bert M. Fernald	"	1909–11
Frederick W. Plaisted	Democrat	1911–13
William T. Haines	Republican	1913–15
Oakley C. Curtis	Democrat	1915–17
Carl E. Milliken	Republican	1917–21
Percival P. Baxter	"	1921–

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MAINE, Sir Henry James Sumner (1822–88). An English scholar and jurist. He was born Aug. 15, 1822, and in 1840 he went to Pembroke College, Cambridge. After a brilliant career as student he was made tutor in Trinity College in 1845 and in 1847 he was appointed regius professor of civil law in the university. He resigned in 1854 to become reader on jurisprudence in the Middle Temple. In 1862, after repeated invitations, he went to India as law member of the Indian Council. This office he filled with high distinction, his extensive knowledge of primitive peoples enabling him to introduce many important legislative reforms. He remained in India until 1869. On his return to England he was elected professor of jurisprudence at Oxford, and the next year he was made a member of the Council of the Secretary of State for India, receiving the dignity of knighthood. In 1877 he was elected master of Trinity Hall, Cambridge, and in 1878 he resigned his Oxford professorship. In 1887 he became professor of international law at Cambridge. His academic duties did not prevent him from residing in London, where he figured as a successful journalist and as a valued member of the Council for India. He published a number of works embodying his research on the origin and development of institutions, the condition of primitive society, and the growth of law and legal conceptions. On these subjects he is one of the highest authorities. The value of his contributions to science was recognized by various foreign societies which elected him to membership. His chief works are: *Roman Law and Legal Education*, published in the *Cambridge Essays* (1856); *Ancient Law* (London, 1861); *Village Communities in the East and West* (ib., 1871); *Lectures on the Early History of Institutions* (1875); *Modern Theories of Succession to Property* (1878); *Dissertations on Early Law and Customs; Popular Government* (1885). These works are characterized by keenness of judgment, wide learning, and literary finish. He died in 1888. Consult: Frederick Pollock, *Oxford Lectures* (Oxford, 1890), and M. E. Grant-Duff, *Sir Henry Maine: A Brief Memoir of his Life* (London, 1892).

MAINE, University of. A coeducational State institution at Orono, Me., founded on the national land grant in 1865 under the name of the State College of Agriculture and Mechanic Arts. The present name was assumed in 1897. The university comprises the colleges of Arts and Sciences, Agriculture, Technology, and the college of Law at Bangor. The Maine Agricultural Experiment Station is a department of the university. The university confers the bachelor's and master's degrees in arts, philosophy, science, and law; the bachelor's degree in agriculture, engineering, forestry, and home economics; the degrees of chemical, civil, mechanical, and electrical engineer, and pharmaceutical chemist. Military instruction is required by law. Students are admitted upon examination or on a certificate from an accredited school. The total attendance in 1913–14 was 1058, and the faculty numbered 126. The library contained about 40,000 volumes. The endowment was $238,300; the value of grounds and buildings, $588,483; and of all other college property, $230,000. The income was (1913–14) $396,616, of which $30,000 was received from the Federal government for the experiment station and $50,000 was provided by the continuing State appropriations. The college of Arts and Sciences maintains a summer term. The president in 1915 was Robert Judson Aley.

MAINE DE BIRAN, mân de bē′räN′, François Pierre Gonthier (1766–1824). A French metaphysician. He was born at Bergerac in the Department of Dordogne and was trained by the *frères doctrinaires* of Périgueux. In 1785 he joined the bodyguard of Louis XVI, but retired to his native town soon after the outbreak of the Revolution. He was elected to, but not allowed to serve with, the Five Hundred in 1797, became *sous-préfet* of Bergerac in 1806, Count of the Empire in 1809, and in 1812 made his permanent home in Paris. He changed from Napoleon to the Bourbons, sat in the loyal chamber of 1816, and remained an ardent royalist till his death, July 20, 1824. Maine de Biran published very little during his lifetime, and his full importance was appreciated only by those who knew him intimately, men like Royer-Collard and Cousin, the latter of whom speaks of Biran as his teacher. His theories in their entirety remained unknown until Cousin published a second installment of his works in 1841, and Naville issued his *Life* (1851) and an edition of his important writings (1859). Chief among these are: *Nouvelles considérations sur les rapports du physique et du moral de l'homme; Essai sur les fondements de la psychologie; Nouveaux essais d'anthropologie.* In the beginning Biran was a sensualist and a follower of Condillac, but found physiological mechanism incapable of explaining the phenomenon of consciousness. He worked out a system of personality in which the ego was made the centre of the universe, original and uncreated itself, creating everything outside itself. This ego Biran identified with living force—will (in this anticipating Schopenhauer). At first will is merely blind, unconscious effort (like Schopenhauer's will-to-live); passing through the stages of sensation, or glimmering consciousness and perception, or the consciousness of concrete objects, it attains its highest development in reflection, abstract thought, when the ego formulates mathematical truths and is capable of contemplating itself. Life, then, is will; and the outer world is not material, but merely the impression produced by the clashing of other wills against our own. The world exists only as conditioned by will; God exists because the idea of God is necessarily grounded in the nature of the will. If the world, he went on to argue, is the realization of will, does not the unchanging order of the universe presuppose an invincible, infallible will, striving ever at one aim according to immutable laws of its own nature? Such an exalted living force Biran failed to find in the pitiful human will, and he saw himself driven into the assumption of a superhuman will, whose image the universe might be—God. And as formerly everything and God were to him creatures of man's will, now everything, including man, was but the manifestation of the divine will. Consult: J. E. Naville, *Maine de Biran* (3d ed., Paris, 1874); Albert Lang, *Maine de Biran und die neuere Philosophie* (Cologne, 1901); N. E. Truman, *Maine du Biran's Philosophy of Will* (New York, 1904); Marius Couaillhac, *Maine de Biran* (Paris, 1905).

MAINE-ET-LOIRE, â lwär. A northwestern inland department of France, bounded on the west by the Department of Loire-Inférieure and on the east by that of Indre-et-Loire (Map: France, N., E 5). Area, 2787 square miles. It is bisected from west to east by the Loire. It is a gently rolling country with fertile soil, producing cereal and vegetable crops and a variety of excellent fruits. The vine is largely cultivated; stock raising is carried on. Iron and coal mines are worked; there are numerous mills and factories for the production of cotton, woolen, and linen goods; and a good river trade in live stock, cereals, hemp, and cotton passes down the Loire. Capital, Angers. Pop., 1901, 514,658; 1911, 508,149.

MAINE LIQUOR LAW. See MAINE.

MAIN GUARD. The principal guard of a post or camp is called the main guard, to distinguish it from purely local or minor guards, as stable guard, park guard, etc. Where regiments are brigaded together on service or in camp it is the guard pertaining to the camp and brigade headquarters. See GUARD.

MAINLAND, mān′land, or POMONA. The largest of the Orkney Islands (q.v.).

MAINLAND. The largest of the Shetland Islands (q.v.).

MAIN′PRIZE, or **MAIN′PRISE** (OF. *mainprise, meinprise*, surety, bail, from *mainprendre*, to take surety, from *main*, hand, from Lat. *manus*, hand + *prendre*, to take, from Lat. *prendere, prehendere*, to seize, from *præ*, before + *hendere, Gk. χανδάνειν, *chandanein*, to seize; ultimately connected with Eng. *get*). In English law, a proceeding by which a person was temporarily released from prison upon an undertaking being given by one or more responsible persons, known as mainpernors, to produce him at the trial. It is very ancient in its origin and was common in the reign of Edward I. It differed from bail in that the mainpernors had not the custody of the released prisoner and could not surrender him up at discretion as in case of bail. The practice is now obsolete, having been superseded by bail (q.v.).

MAINS, GEORGE PRESTON (1844–). An American Methodist Episcopal clergyman and publisher, born at Newport, N. Y. He served in the United States navy under Admiral Porter in 1864–65; graduated from Wesleyan University in 1870; and entered the ministry, joining the New York East conference of his denomination. Subsequently he filled pastorates in New York, Brooklyn, and Connecticut. He served one year as presiding elder; for a time was superintendent of the Brooklyn Church Society; and was a delegate to every General Conference after 1892. In 1896 he became one of the board of managers of the Methodist Board of Foreign Missions, treasurer of the Episcopal Fund, and one of the publishing agents of the Methodist Book Concern. His writings include: *The Life of Francis Asbury* (1909); *Modern Thought and Traditional Faith* (1911); *Some Moral Reasons for Belief in the Godhead of Jesus Christ* (1912); *Christianity and the New Age* (1914).

MAIN′TENANCE (OF., Fr. *maintenance*, from *maintenir*, to maintain, from Lat. *manu tenere*, to hold in the hand, from *manu*, abl. sing. of *manus*, hand + *tenere*, to hold). In its legal sense, an officious intermeddling by a person in litigation in which he is not concerned or financially interested, by assisting either party with money or otherwise. It includes the offense of champerty, which consists of maintenance for reward or for a share in the proceeds of the litigation promoted. A maintenous agreement is illegal and therefore void, and the offense is punishable as a crime at common law on the theory that it tends to increase groundless and vexatious litigation and to obstruct the administration of justice. The early common law carried the doctrine to extremes, and it was formerly dangerous for a man to advise a friend to consult a lawyer to protect his rights, but it has been greatly modified in the course of time, and to-day where the common law prevails the wrongful intention with which the assistance is given is considered the gist of the offense. Thus, if one assists a relative or a friend to carry on litigation solely because of the relationship existing between them, or if a master assists a servant or any one assists another from motives of charity, he is not guilty of maintenance. At common law a civil action for damages may be brought by the injured party against a maintainor of the suit against him, and such right still exists in many jurisdictions where maintenance as a criminal offense is no longer recognized. In several States it is no longer recognized as a criminal offense and probably not as a civil cause of action. See BARRATRY; CHAMPERTY. Consult the authorities referred to under CRIMINAL LAW; TORT.

MAINTENON, mäɴ′t′-nôɴ′, FRANÇOISE D'AUBIGNÉ, MARQUISE DE (1635–1719). Mistress and second wife of Louis XIV. She was the daughter of Constant d'Aubigné and of Jeanne de Cardillac, and granddaughter of Théodore Agrippa d'Aubigné, the famous Protestant champion. She was born Nov. 27, 1635, in the prison at Niort, where her parents were then incarcerated. On obtaining their release, her parents went to Martinique, where the father died in 1645. After her father's death, Françoise returned to France with her mother, after whose death her father's sisters took her under their care and educated her in a convent, where her conversion to the Roman Catholic religion was accomplished at the age of about 14. When she was 16 she became acquainted with the poet

Scarron (q.v.), who, struck by her beauty, intelligence, and helpless condition, offered her his hand, or, if she should prefer it, a sum of money sufficient for her entrance into a nunnery. Although Scarron was lame and deformed, she chose to marry him, and lived in the midst of the intellectual society which frequented the house of the poet. On his death in 1660 she was reduced to great poverty; but through the intervention of Madame de Montespan (q.v.) obtained a pension from the King. In 1669 she was intrusted with the education of the two sons whom Madame de Montespan had borne to Louis XIV, and in this capacity attracted the attention of the King by her excellent intellectual gifts, finally supplanting Madame de Montespan in the changeable monarch's regard. War between the two women resulted in the triumph of the new favorite. The King bestowed on her the sum of 100,000 livres, with which she bought the estate of Maintenon and in 1675 received the title of marquise, and from that time to the end of his life she exercised an extraordinary ascendancy over him. She had become an ardent Catholic and exerted a powerful religious influence over the King, and although keeping herself in the background was able to direct foreign policy and internal affairs in the interests of clericalism. She favored the Revocation of the Edict of Nantes, but was opposed to the violent persecutions that followed it. Louis privately married her in 1684, soon after the death of the Queen, and, though she was never publicly acknowledged as his wife, her position at court was quite different from that of her predecessors in the favor of the King. She carefully brought up the children of Madame de Montespan; and it was at her instigation that Louis legitimatized them. When he died in 1715 she retired to the former abbey of St. Cyr, which, at her wish, had been changed 30 years before into a convent for young ladies. Here she died, April 15, 1719.

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MAINZ, mīnts (Fr. *Mayence*). The largest town in the Grand Duchy of Hesse, and one of the most ancient cities of Germany and a great fortress of the Empire (Map: Germany, C 4). It is situated on the left bank of the Rhine almost opposite the influx of the Main, about 18 miles northwest of Darmstadt. The southern and older part of the city, with its narrow and irregular streets and Gothic buildings, presents a striking contrast to the modern quarters in the north, built up since the reconstruction of the fortifications. A fine modern bridge of five arches crosses the Rhine, whose width here is the greatest of its upper course, to Kastel. During the three years prior to 1910 Kastel and other suburbs were annexed to Mainz. A handsome esplanade extends along the left bank of the river.

In the centre of the old town stands the cathedral, imposing in appearance and showing in its numerous additions and alterations traces of an eventful existence. It was constructed in 978–1008, but the present building dates principally from the thirteenth century, the original structure having been destroyed by several conflagrations. It is Romanesque with Gothic additions and details, and is surmounted by six towers, of which the highest rises to 270 feet. Noteworthy features are the tenth-century brazen doors of the main entrance and the tombs of Boniface, the first Archbishop of Mainz, of Frauenlob the Minnesinger, and of numerous archiepiscopal electors. The cathedral was restored in 1856–79. Mainz has several other Roman Catholic churches, the most notable of which are those of St. Stephen, St. Ignatius, and St. Peter. The church of St. Stephen (1257–1328), with interesting cloisters, has a sightly situation above the Rhine; that of St. Ignatius has a finely painted ceiling. On the Gutenberg-Platz, near the cathedral, stands a Thorvaldsen monument (1837) to Gutenberg, a native of Mainz.

Facing the Schloss-Platz is the former electoral palace (1627–78), now used as a museum. It is a red sandstone building of large proportions. It contains one of the most extensive collections of Roman and Germanic antiquities in Germany, the municipal library of 230,000 volumes (1913) and numerous manuscripts, a rather unimportant picture gallery, and the Gutenberg Museum, founded in 1901. The former lodge of the Teutonic Order (1731–39) is now used as the grand-ducal residence. Mainz has also a number of fine modern buildings, notably the city hall, the theatre, and the central railway station.

The fortifications, enlarged since 1871, consist of several lines of bastioned forts, the citadel in the southeastern part of the town, and a number of detached forts. Kastel, on the opposite side of the Rhine, forms the *tête de pont*. There are numerous Roman remains in the town and the vicinity, including parts of an aqueduct and what is supposed to be a monument to Drusus. The chief educational institutions comprise two Gymnasia, a seminary for priests, a school of commerce, and a number of other special schools. The university founded in 1477 was suppressed in 1798.

Mainz is well known for its leather goods and furniture, and it manufactures also musical instruments, carriages, carpets, and chemicals. Book and art publishing is also carried on extensively. Mainz is well adapted for commerce by its position at the confluence of two important waterways; but the competition of other

Rhine ports has detracted somewhat from its prominence in trade. The city is still, however, an important factor in the Rhine traffic with the Netherlands and Belgium. Pop., 1890, 72,059; 1900, 84,251; 1905, 91,179 (largely Roman Catholics, the number of Evangelicals being 34,607 and of Jews 3058); 1910, 110,634 (including districts annexed in 1912, 118,107).

The site of Mainz was occupied in ancient times by a Celtic settlement, which was later converted into a Roman camp. Drusus erected here in 13 B.C. a castle called Maguntiacum, and the settlement was connected by a bridge with the Castellum Mattiacorum (Kastel) on the opposite shore. With the dissolution of the Roman Empire Mainz was repeatedly pillaged by the Allemanni, the Vandals, and the Huns, but it gradually recovered, and by the tenth century was regarded as an important city. It obtained privileges from Charlemagne and headed the league of Rhenish towns in the thirteenth century. In the fifteenth century Mainz acquired great celebrity on account of Gutenberg, and became the centre of early book printing.

The decline of the city began in the second half of the fifteenth century, when it was deprived of its Imperial privileges for its support of the Archbishop Diether von Isenburg and became an archiepiscopal city. Mainz was occupied by the Swedes in 1631 and by the French in 1644 and 1688. In 1792 the city, deserted by the Prince-Elector and the court, capitulated to the French under General Custine, was retaken in the following year, and formally ceded to France by the Peace of Lunéville in 1801. It was returned to Germany by the Peace of Paris in 1814, and was annexed to the Grand Duchy of Hesse in 1816, remaining, however, a fortress of the German Confederation.

The archbishopric of Mainz was founded in 747 with St. Boniface as its first Archbishop. The archbishops of Mainz were preëminent among the spiritual electors of the Empire. The archbishopric was degraded to a bishopric in 1801, and the see was secularized in 1803. Consult K. Hegel (ed.), *Die Chroniken der mittelrheinischen Städte: Mainz* (2 vols., Leipzig, 1881–82).

MAIOLICA, mȧ-yŏl′ĭ-kȧ. See MAJOLICA.

MAIPO, mī′pō, or **MAIPU**, mī′po͞o. A river of Chile, rising in the Andes and flowing westward 120 miles into the Pacific Ocean. It passes a few miles south of the city of Santiago. On its banks was fought on April 5, 1818, the decisive battle which secured the independence of Chile.

MAIPURE, mī-po͞o′rȧ. A prominent and populous group of tribes of Arawakan stock (q.v.), formerly dwelling on the Ventuari River, an upper affluent of the Orinoco, in southern Venezuela. Two centuries ago they were one of the leading mission tribes of the Orinoco region, but, like many others, gradually wasted away before the incessant inroads of the Caribs, who were accustomed to make periodical expeditions up the river in fleets sometimes of a hundred canoes, destroying every village along its banks.

MAIR, mâr, CHARLES (1840–). A Canadian poet and journalist of Scottish descent, born at Lanark, Ontario. He was educated at Queen's University, Kingston, afterward studied medicine, and was for some time engaged in business, in the meantime contributing both in prose and verse to leading periodicals. He went to the Canadian Northwest and became the Fort Garry (now Winnipeg) correspondent of the Montreal *Gazette*. During the first rebellion (1869) of Louis Riel (q.v.) he was imprisoned and condemned to death; but he escaped and served as a government medical officer during Riel's second rebellion (1885). After living on a ranch in British Columbia for some years he returned to Saskatchewan, and later entered the civil service at Lethbridge, Alberta. He was one of the founders of the Canada First party (1870). In 1889 he was elected a fellow of the Royal Society of Canada. He published: *Dreamland and Other Poems* (1868); *Tecumseh: A Drama* (1886); *The Last Bison* (1888); *Through the Mackenzie Basin* (1908).

MAIR, JOHN. See MAJOR, JOHN.

MAIRET, mȧ′rȧ′, JEAN DE (1604–86). A French dramatic poet, born at Besançon. His earlier dramas include: *Silvanire* (1625); *Les galanteries du duc d'Ossone* (1627), a comedy modeled on the Italian order; *Sophonisbe* (1629), the first of French classical tragedies to be given on the regular stage. His other works are of little importance. He became involved in the quarrel that followed the presentation of the *Cid* (1637), and Mairet and Scudéry were Corneille's bitterest opponents.

MAISCH, māsh, JOHN MICHAEL (1831–93). An American pharmacist, born in Hanau, Germany. He was educated in his native town and came to the United States in 1849. In 1861–63 he was professor of materia medica in the New York College of Pharmacy, and from 1866 until his death professor of materia medica and botany at the Philadelphia College of Pharmacy. He was editor of the *American Journal of Pharmacy* from 1871 to 1893; assisted in the preparation of *Griffith's Universal Formula* (3d ed., 1874); with Stillé edited the *National Dispensatory* (4th ed., 1879–86); and published *A Manual of Organic Materia Medica* (1881; 7th ed., 1899).

MAISON, mȧ′zôɴ′, NICOLAS JOSEPH (1770–1840). A French marshal, born at Epinay (Seine). He entered the army in 1792 and seven years later was adjutant general under Bernadotte. He distinguished himself at Austerlitz in 1805 and was prominent in the campaigns that followed that battle, but did not attain the rank of general of division until 1812 after the battle of Polotsk. In 1813 he was at the head of the Army of the North and maintained a sturdy resistance against the allies. After Napoleon's abdication he attached himself to the government of Louis XVIII, was made a peer, appointed Governor of Paris in 1815, and became a marquis in 1817. During the expedition to Morea in 1828–29, which he commanded, he received the baton of marshal. He was for a short time Minister of Foreign Affairs in 1830, and afterward Ambassador to Vienna (1831), to St. Petersburg (1833), and Minister of War (1835–36).

MAISON CARRÉE, mȧ′zôɴ′ kȧ′rȧ′. A beautiful and well-preserved Roman temple at Nîmes, France, dating probably from the early years of the Christian era, though some authorities have placed it as late as the second century A.D. The building is of Corinthian architecture and measures 45 by 85 feet. It stands on a platform approached by 15 steps. It is surrounded by 30 columns of which six form the façade and 20 are engaged in the walls of the cella. After serving as a church and for other uses it is now used as a museum.

MAISON DORÉE, dô′râ′ (Fr., gilded house). A famous Parisian restaurant on the Boulevard des Italiens, built in 1839. When in recent years the former extravagance in dining passed away, such establishments ceased to be profitable, and in 1903 the Maison Dorée was compelled to close its doors.

MAISON DU ROI, dụ rwä (Fr., house of the King). A title applied during the monarchical régime in France to a select corps of troops, including the Gardes du Corps, Chevauxlégers, Mousquetaires, Grenadiers à Cheval, the French and Swiss Guards, and the Cent Suisses. During the reign of Louis XIV they were entirely separate from the regular army establishment. They corresponded to the present Household Troops (q.v.) of England.

MAISONNEUVE, mâ′zô′nēv′. A city within the territorial limits of the city of Montreal, Canada. Among its notable buildings and institutions are the city hall, public market, post office, public bath and gymnasium, and the dry dock and navy yard. There are about 45 industries employing about 18,000 hands, and the chief manufactures include sugar, cotton and cotton goods, thread, foundry and machine-shop products, boots and shoes. In 1910 the manufactured output, which ranked as sixth in Canada, was valued at $20,813,774, as compared with $6,008,780 in 1900. The city is abundantly supplied with water and electric power for manufacturing purposes. Pop., 1901, 3958; 1911, 18,684; 1915 (local est.), 36,500.

MAISONNEUVE, Paul de Chomedey, Sieur de (?–1676). A French colonial Governor in Canada and founder of Montreal. He was born in Champagne. He early entered the French army and served in many campaigns in Holland. He became interested in the attempt to found a religious colony in New France by the body afterward known as the Associates of Montreal, and in 1641 with 40 men and four women reached Quebec. The next year, on May 18, he founded the city of Montreal, of which he was Governor for 22 years. Troubles came fast, and all his wisdom and firmness were necessary to keep the colony on its feet. The patrons had no conception of its economic needs, as they were moved entirely by religious enthusiasm. He was continued as Governor after the colony came under Sulpician auspices, though much harassed by the government at Quebec, which resented the virtual independence of Montreal. On this account he was removed by De Tracy in 1665 and sent to France, where he died in obscurity. He was a brave, disinterested man, who gave all his energies to the service of the colony.

MAISTRE, mâ′tr′, Joseph, Count de (1754–1821). A French philosopher and political writer and statesman in the service of Sardinia, born in Chambéry of a noble French family that had settled in Savoy when it belonged to the Sardinian Kingdom. Driven from his native country by the invasion of the French (1792), De Maistre, who was a member of the Senate, escaped first to Lausanne and then to Turin, and when, in 1798, the King was compelled to abandon his continental possessions, De Maistre accompanied the court to the island of Sardinia. From 1803 to 1817 he represented his impoverished King at St. Petersburg, and upon his return was appointed Minister of State and Regent of the Grand Chancery. It was during this long period of comparative peace that most of his literary work was done. De Maistre was an ardent advocate of legitimacy, and in his later career became one of the most eminent writers of the new (or liberal) conservative school in politics and religion, of which Chateaubriand may be regarded as the head. His first work of note was *Considérations sur la France* (1796), in which he combated the revolutionary doctrines then in vogue. His later works include: *Essai sur le principe générateur des constitutions politiques* (1810), advocating an absolute monarchy; *Du pape* (1819; new ed., 1891), probably the best modern defense of the spiritual and temporal power of the Pope; *De l'église gallicane* (1821–22). His *Les soirées de Saint Petersbourg* (1821; new ed., 1888), *Examen de la philosophie de Bacon* (1836), *Lettres et opuscules inédits du comte Joseph de Maistre* (1851), and *Mémoires politiques et correspondance diplomatique* appeared posthumously. *Quatre chapitres inédits sur la Russie par le comte Joseph de Maistre* (1859) was published by his son Rodolphe. There are also editions of his *Œuvres complètes* (1864) and *Œuvres posthumes* (1864).

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MAISTRE, Xavier de (1763–1852). A French essayist and novelist, brother of Joseph de Maistre (q.v.). Having been in the military service of Sardinia, on its conquest by the French he emigrated to Russia (1799), where he became major general and took part in the Persian campaign, gathering there materials for his most famous story, *Les prisonniers du Caucase* (1825). His first book, *Voyage autour de ma chambre* (1794), was written in the style of Laurence Sterne, in Turin, while De Maistre was under arrest for participation in a duel. The *Expédition nocturne autour de ma chambre* (1825), in like style, was less successful. He wrote also two stories, *Les lépreux de la cité d'Aoste* (1811) and *Prascovie, ou la jeune Sibérienne* (1825), imitated from Madame Cottin's once noted *Les exilés de Sibérie* (1806). His essays are a genial afterglow of eighteenth-century wit, and his stories are models of vigorous and direct narration, combining power of exact description with sentimental affectation in a way that puts him quite apart among the French novelists.

MAISUR, mī-sōōr′. See Mysore.

MAITLAND, māt′land. A town of New South Wales, Australia, in Northumberland County, on the Hunter River, 119 miles by rail north of Sydney and 15 miles by rail northwest of Newcastle (Map: New South Wales, F 3). It is divided by the river into East and West Maitland, two distinct municipalities. In either division are handsome banks, churches, and other public buildings. In West Maitland, the more populous part, are several coach-building factories, tobacco factories, and several mills, including a paper mill. Good coal is mined in the neighborhood. The district is called the "garden of New South Wales," and an extensive trade is carried on in agricultural produce. The Maitland coal field is one of the greatest and finest in the world, a great district being underlain by huge seams of pure coal, up to 33 feet in thickness, worked by splendid plants. Total population of East and West Maitland, 1903, 10,340; 1911, 11,313.

MAITLAND. The family name of the earls and dukes of Lauderdale (q.v.).

MAITLAND, Edward (1824–97). An English mystical and humanitarian writer, born at Ipswich. After graduation from Caius College, Cambridge (B.A., 1847), a sojourn in California in 1849, and experience as Commissioner of Crownlands in Australia, he settled down in London to his life work as a writer (1857). Many of the vicissitudes of his inner and outer life are reflected in his romance, *The Pilgrim and the Shrine* (1867), which was followed by *The Higher Law* (1869), in which the hero presents himself as rising superior to traditional morals. By this time Maitland had become a figure in society and in letters. In 1873 he made the acquaintance of (Mrs.) Anna Kingsford, with whom he and his work were closely associated until her death (1888). Meantime he and she collaborated in *The Keys of the Creeds* (1875) and in *The Perfect Way, or the Finding of Christ* (1882); and with one accord they opposed themselves to orthodoxy, animal food, materialism, and vivisection. In 1884 he and Mrs. Kingsford withdrew from the Theosophical Society, which they had joined in 1883, and founded the Hermetic Society, and Maitland became more and more the mystagogue, and at last became apparently somewhat unbalanced and distraught. He claimed a special sense by which he could discern the spiritual condition of others and could see the souls of trees and men; and he recalled incidents of his previous incarnations as an ancient Theban, Marcus Aurelius, St. John the Evangelist, etc. In later life his chief aim was to live up to his motto "An honest God's the noblest work of man," and for the creation of a deity after his own heart he labored ceaselessly, leaning the while upon Oriental and Occidental mystics and transcendentalists of the past and the present. Of his later works must be mentioned: *Clothed with the Sun: Being the Book of the Illuminations of Anna (Bonus) Kingsford* (1889); *The New Gospel of Interpretation* (1892); *Anna Kingsford: Her Life, etc.*, which he regarded as his *magnum opus*. His writings, especially *Anna Kingsford*, abound in autobiographical data.

MAITLAND, Frederick William (1850–1906). An English legal scholar and historian. He was educated at Eton and at Trinity College, Cambridge (B.A., 1873; M.A., 1876). In 1884 he became reader in English law at Cambridge, and in 1888 Downing professor. His writings, almost entirely on the early legal institutions of England, have exerted a great influence in this field upon English and American students. His greatest work is the *History of English Law*, the first edition of which appeared in 1895. In this he was assisted by Sir F. Pollock. The work extends to 1307 and cleared up a great number of problems, as did also his series of essays known as *Domesday Book and Beyond* (1897). Another interesting work of Maitland is *Roman Canon Law in the Church of England* (1898), a collection of essays, in which he undertakes to refute the claims of the High Church party, who maintain that the canon law of Rome was never binding on the ecclesiastical courts of England. Free from all pedantry, the very manner and style of Maitland's writings lend surprising interest to topics which the layman might expect to find dry and repellent. His works belong to English letters as well as to English law. His *Life of Leslie Stephen* (1906) is a biography of remarkable charm. Maitland received honorary degrees from Oxford, Cambridge, Glasgow, Cracow, and Moscow, besides many other marks of distinction. Other works of his are: *Gloucester Pleas* (1884); *Justice and Police* (1885); *Bracton's Note-Book* (1887); *Township and Borough* (1898).

MAITLAND, John Alexander Fuller. See Fuller-Maitland, John Alexander.

MAITLAND, Sir Peregrine (1777–1854). A British general and colonial administrator, born at Longparish House, Hampshire. In 1814 he was made a major general and in 1815 took part in the Waterloo campaign. He was Lieutenant Governor of Upper Canada in 1818–28, but his inexperience in civil government led him to rely too much upon his councilors, while his want of tact and autocratic Toryism rendered him unpopular with the mass of the Canadians. The only important event of his administration was the beginning of the Welland Canal. After leaving Canada he was Lieutenant Governor of Nova Scotia from 1828 to 1834, though he spent but one of those years at his post. In 1830 he was promoted lieutenant general; he was commander of the Madras army in 1836–38 and Governor and commander in chief at the Cape of Good Hope in 1844–47. He was knighted in 1852.

MAITLAND, Sir Richard, Lord Lethington (1496–1586). A Scottish lawyer and antiquary of an Anglo-Norman family long settled in Berwickshire. His father, Sir William Maitland of Lethington, was killed at Flodden. Richard Maitland was educated at the University of St. Andrews and studied law in Paris. Returning to Scotland, he was nominated heir to his father and entered the service of James V. During the troubled years that followed the death of the King he aimed at an independent course. As a commissioner in settling disputes on the borders he became famous. On Queen Mary's return from France in 1561 he became an ordinary Lord of Session and a member of the Privy Council, and the next year he was appointed Keeper of the Great Seal. Though totally blind, he held the seal till 1567, and his position on the bench till 1584. He died March 20, 1586. Maitland is remembered mainly for his valuable collection of early poems, in two volumes, now preserved at Magdalene College, Cambridge. Selections from it were published by John Pinkerton under the title, *Ancient Scottish Poems never before Published* (1786). Maitland's own poems, which possess considerable interest, were published with a memoir in 1830 by the Maitland Club, a society founded at Glasgow in 1828 for printing ancient Scottish manuscripts. Some of them were reprinted in the collection entitled *Scottish Poetry of the sixteenth-century* (1892). His *History of the House of Seytoun*, with the continuation by Viscount Kingston, was published by Fullerton (Glasgow, 1829).

MAITLAND, Samuel Roffey (1792–1866). A Church of England scholar. He was born in London and studied at Trinity College, Cambridge, without graduation, as he was not a member of the Church of England. He studied law and was admitted to the bar in 1816, then studied theology and was ordained in the Church of England in 1821. He held perpetual curacy of Christ Church, Gloucester, 1823–29, but resigned to devote himself to literature. In 1838 he was appointed librarian to Dr. Howley, Archbishop of Canterbury, and keeper of the Lambeth manuscripts, retaining the office until the death of the Archbishop, in 1848. From 1839 to 1849 he edited the *British Magazine,* in which he wrote valuable articles, chiefly on prophecy, Church history, criticism, etc. His principal historical works are: *An Inquiry into the Grounds on Which the Prophetic Period of Daniel and Saint John has been Supposed to Consist of 1260 Years* (London, 1826); *Facts and Documents Illustrative of the Doctrines and Rites of the Ancient Albigenses and Waldenses* (1832); *The Voluntary System* (1834); *The Dark Ages: A Series of Essays Intended to Illustrate the State of Religion and Literature in the Ninth, Tenth, Eleventh, and Twelfth Centuries* (1844); *Essays on Subjects Connected with the Reformation in England* (1849); *Superstition and Science* (1855). He wrote also numerous pamphlets, letters, and reviews. He was an omnivorous reader and a man of broad sympathies.

MAITLAND, William (?1528–73). A Scottish statesman, better known as "Secretary Lethington." He was the eldest son of Sir Richard Maitland (q.v.), of Lethington. He was educated at St. Andrews and on the Continent and quickly displayed great aptitude for a political career. He became a convert to the Reformed doctrines about 1555, but could not have been a violent partisan, since in 1558 he was appointed Secretary of State by Mary of Guise. In the following year, however, he openly joined the Lords of the Congregation and was one of the Scottish commissioners who met the Duke of Norfolk at Berwick to arrange the conditions on which Queen Elizabeth would give them assistance. In 1561, after the arrival of Queen Mary from France, he was made an extraordinary Lord of Session. He strongly objected to the ratification of Knox's *Book of Discipline* and in 1563 conducted the prosecution raised against Knox for treason; from this time he appears to have split with the Reformers. In 1564 he held a long debate with Knox on the claims of the Reformed church to be independent of the state. In 1566 he took part in the plot against Rizzio, after whose assassination he was proscribed and obliged to seek shelter for some months in obscurity. He was cognizant of Bothwell's scheme for the murder of Darnley; yet when he saw the hopeless nature of Bothwell's designs he immediately joined the confederacy of the lords. While Mary was still a prisoner at Lochleven he is said to have written to her offering his services, yet he was present at the coronation of King James VI, 1567; and although he secretly aided in the escape of the Queen, he fought against her on the field of Langside. In 1568 he accompanied the regent Murray to the conferences held at York regarding the Scottish Queen; but even here he tried to further her interests, and is said to have been the first to propose to the Duke of Norfolk a union between him and Mary. The Scottish lords felt that he was a dangerous enemy to the commonwealth, and in 1569 he was arrested at Stirling for complicity in Darnley's murder, but was liberated shortly after by an artifice of Kirkaldy of Grange. After the murder of the regent Murray he and Kirkaldy became the leaders of the Queen's party, in consequence of which he was declared a rebel, deprived of his offices and lands by the regent Morton, and besieged, along with Kirkaldy, in Edinburgh Castle. After a long resistance the castle surrendered, and Maitland was imprisoned in Leith, where he died (1573). Buchanan drew his character with a severe pen in *The Chameleon.* In a more charitable estimate he appears as one of the most substantial men of his time, as placing the welfare of Scotland above the bigotry of both Catholics and Protestants, and as governed throughout his career principally by a desire for the union of the crowns of England and Scotland. Consult: George Chalmers, *Life of Mary, Queen of Scots* (3 vols., London, 1822); Sir John Skelton, *Maitland of Lethington* (ib., 1887–88); Andrew Lang, *A History of Scotland* (Edinburgh, 1904–1907); E. Russell, *Maitland of Lethington: A Study of his Life and Times* (London, 1912).

MAÎTRE D'ARMES, mȧ′tr′ därm (Fr., master of arms). A fencing master. In the French army a maître d'armes is assigned to each regiment. In the United States army there is one master of the sword, with the pay of captain, who is on duty at the United States Military Academy as instructor in fencing, military gymnastics, and physical culture. See Fencing.

MAÎTRE DE FORGES, de fôrzh, Le (The Iron Founder). A romance by Georges Ohnet (1882). It was dramatized by the author and presented at the Paris Gymnase in 1883.

MAITREYA, mī-trā′yȧ. A proper name derived from Sanskrit *mitra,* friend, and designating in its Pali from *Metteyya,* the future Buddha, the Buddha of Friendship, who will appear 5000 years after Gautama. At present he is believed to be in the Tushita Heaven of the Blest. He is known in Tibet as Jampa (Tib. *Byams-pa,* pronounced Jam-pa or Champa) and is believed to be of gigantic size, so that colossal statues are used to represent him. The worship of Maitreya overshadowed that of Buddha in the Hosso sect, which flourished in Japan in the eighth century of our era. Consult: Schlagintweit, *Buddhism in Thibet* (London, 1868); Waddell, *The Buddhism of Tibet* (ib., 1895); Rhys Davids, *Buddhism* (ib., 1900).

MAIZE (Sp. *maíz,* from Haïtian *mahiz, mahis,* the native name), or Indian Corn (*Zea mays*). An annual grass with erect stems and spreading leaves; male or staminate flowers borne upon the summit of the stem, which is commonly designated the tassel; and the female flowers upon the ear, which rises from the axils of the leaves. The protruding styles of the female flowers are called the silk, and the united pistillate spikes the cob. Fertilization of the pistillate flowers is accomplished by the wind or other agencies, which carry pollen from the staminate flowers to the silk. The botanical relationship of maize is shown in the discussion of grasses. Its nearest relative is probably the Mexican teosinte (*Euchlæna luxurians*), a plant of the same general habit of growth. Experiments conducted by Harshberger and others have seemed to show that the wild form (which is unknown), or the plant from which maize was derived, is teosinte. Maize differs from most grasses in having solid instead of hollow stems. Adventitious roots are often developed from the nodes near the ground, which serve to brace the plant against winds. The plant varies in height from less than 2 feet in dwarf varieties to more than 30 feet, reported for some forms in the West Indies. Specimens more than 20 feet tall are not infrequent in the rich river valleys in the United States. The size of the ear and size, color, and hardness of the grain show marked variation. Ears vary in length from an inch in varieties of popcorn to 15 inches or more in the dent varieties. White, black, yellow, and red, with numerous variants, are the colors of the grain. In some the grain is no larger than rice grains; in a South American variety, cuzco, the individual grains often weigh 35 times as much as the small popcorn grains. All degrees of hardness are shown, ranging from the flint varieties (so called from their extreme hardness) to the squaw corn and flour corn, the grains of which are so starchy and soft as to be readily broken between the fingers. The season required for maturing varies from one month in a Paraguayan variety to seven months in others. Maize shows a remarkable tendency to mix, as the blending of varieties is called, the pollen of one variety showing its effect upon the grain of another. This may be seen in the common occurrence of variegated grains and in the deterioration of sweet corn and popcorn when planted near field varieties. Abnormal forms are of frequent occurrence, as cobs with staminate flowers upon their extremities, small ears borne towards the bases of tassels, branched and flattened ears, etc.

Although the widespread cultivation of maize has given rise to very many varieties commonly grouped according to certain characters of the grain, most botanists recognize only a single species, *Zea mays*, of very variable habit. Sturtevant, however, has given to the different groups the following specific names: *Zea tunicata*, pod corns; *Zea everta*, popcorns; *Zea indurata*, flint corns; *Zea indentata*, dent corns; *Zea amylacea*, soft corns; *Zea saccharata*, sweet corns; and *Zea amyleasaccharata*, starchy sweet corns. The first group, *Zea tunicata*, or podded corn, which has a pod or husk for each kernel in addition to the enveloping ear leaves, is considered to be the original form of corn; *Zea everta*, or popcorn, its nearest relative; and *Zea amylacea*, or soft corn, the highest developed form. Milo maize, Jerusalem corn, Kafir corn, Egyptian corn, etc., are not varieties of *Zea mays*, but of *Andropogon*, and are known as nonsaccharine sorghums.

Corn is generally thought to be a native of America, probably grown in a wild state on the plateaus of tropical America. All evidence points to its cultivation by the native tribes long before the discovery of the country by Columbus, who is said to have carried the first grains of corn to Europe on his first return voyage. Its cultivation in Europe spread very slowly. Although introduced into Spain at the end of the fifteenth century, it did not reach France until 100 years later. Historical data concerning its distribution in Europe are conflicting in many instances, but modern agricultural writers, summing up the evidence at hand, believe it was introduced into France and Italy from Spain, into Switzerland and Hungary from Italy, into Austria and southeastern Europe from Hungary, and from Switzerland into the valley of the Rhine. It is said to have been carried to Asia and Africa from Portugal. The distribution of maize on the American continents has been coincident with the progress of the white race in the New World. The limits of the distribution of corn culture are given by De Candolle as 40° S. lat. in South America, 54° N. lat. in North America, and 50° N. lat. in Europe. The popcorn (see below), flint-corn, dent-corn, and sweet-corn groups are represented in the United States by many varieties, the dent corn representing the bulk of the corn produced. In Europe and parts of South America the flint corns are more widely distributed than any other group. Flint corn in numerous varieties has a large, hard kernel, either white, yellow, orange, red, blue, striped, or blazed. The ears are usually from 6 to 12 inches long, and the plants commonly grow from 4 to 8 feet high. Dent corn is characterized by the indentation at the top of the kernel, caused by the drying and shrinking of the starchy matter within. The outer portion of the kernel is corneous, as in the pop and flint corns, but the proportion of starch is greater in this group than in either of the other two. The length of the ear usually varies from 6 to 12 inches, and the height of the plant ordinarily from 6 to 10 feet. Most varieties have white or yellow kernels, but various other colors are represented among the many different sorts. The varieties of dent corn exceed in number those of all the other groups combined.

Corn is a universal crop in the United States and is grown on many different kinds of soil, but for its best growth a well-drained, rich, sandy loam, which does not bake during drought, is required. In preparing the soil for corn it is plowed deeper than for any other cereal crop, the object being to obtain a deep and well-pulverized seed bed. In the northern portion of the Mississippi valley, where the bulk of the world's corn crop is produced and where it matures in about five months, it is planted from about the first of May to the twentieth. In other latitudes planting is done late enough to escape late spring frosts. It is most commonly sown in hills or in drills by means of a corn planter, but it is sometimes also sown broadcast. The hills are about 3½ feet apart each way, and three or four stalks are produced per hill; but when planted in drills, single plants are grown about one foot apart in the row. From the time of planting until the young plants appear above ground the soil is harrowed for the purpose of keeping the surface in a pulverized condition and preventing the growth of weeds. The plants are cultivated with the horse hoe or corn cultivator after they have attained sufficient height and until they are too large to admit of further cultivation without injury to the plants. In the principal corn-producing States of the United States cultivation usually commences about the first of June and lasts for about six weeks. Where corn is grown in hills, or checks, the direction of each cultivation after the first is at right angles to the preceding direction, so that the whole of the surface soil may be stirred. Planted in drills it can be cultivated in one direction only.

The practice of listing corn consists in making alternate ridges and furrows by means of the lister, an implement which ridges the soil and drills the corn into the bottom of the furrows at the same time. No previous plowing is generally given. In cultivating listed corn the soil is thrown from the ridges towards the growing plants, so that by the time cultivation is finished the surface of the land has become level. The practice of listing is not general.

The time of harvesting depends somewhat on the use to be made of the crop. When grown for silage or for fodder, corn is cut when the kernels begin to glaze and the lower leaves begin to dry. For silage the cut stalks are immediately passed through the silage cutter into the silo, and for fodder they are put up in shocks and left to cure in the field. When dry the ears are removed and the stalks (fodder or stover) are used directly for feeding purposes or shredded and then fed. Shredding consists in passing the stalks and leaves through a machine which cuts and tears them in fine pieces. A machine known as the shredder and husker removes the ears and shreds the stalks and leaves. Corn grown for the grain is harvested when it is fully ripe and dry. The ears are gathered, husked, and stored in slat cribs, through which the air passes freely, thus drying the corn and preventing attacks of mold. This method of harvesting corn, for which machines have also been perfected, is known as husking, picking, or shucking, the first being perhaps the most common. The term "snapping" corn refers to gathering the ears with most of the husks attached, which is sometimes done when ripe corn is fed directly from the field. Before it is fed or sold corn is usually shelled by passing the huskless ears through hand or power corn shellers.

The most common disease to which corn is subject is smut (q.v.), against which methods of prevention are not well understood. Rust does no material injury to corn. The bacterial disease of corn sometimes does considerable damage. The principal insect enemy is the cutworm, which destroys the young plants. Extensive injury is frequently done by ground squirrels, which feed on the planted seed. These animals are usually poisoned about planting time with poisoned corn and pumpkin seeds. See CORN INSECTS.

The maize crop of the world is estimated at from 3500 to 4500 million bushels annually. The annual corn production of the United States amounts to nearly 3000 million bushels. The great corn-producing States are Illinois, Iowa, Kansas, Nebraska, Missouri, and Indiana. In 1912 these States produced 1,658,450,000 bushels, or more than one-half of the entire crop of the United States. About 50 bushels per acre are considered a good yield, but the average yield per acre for the whole United States is only about 27 bushels. The largest yield of corn on record, 237 bushels per acre, was produced in South Carolina.

Although the United States produces approximately three-fourths of the corn of the world, it exports comparatively little and has in recent years become an importer of corn, the importation of corn in the fiscal year 1914 having actually exceeded the exportation. Exports usually amount to about 2 per cent of the production, but in recent years have been about 1½ per cent. In 1914 the exports were but 9,381,000 bushels and the imports, chiefly from Argentina, about 12,000,000 bushels. Prior to 1900 the exports ranged from 100,000,000 to 200,000,000 bushels per annum, but have steadily declined, owing to the fact that the corn can be more profitably utilized in the production of meats for exportation or domestic consumption. Argentina, which now ranks next to the United States among the world's corn producers, exports more than half of her product, climatic conditions requiring little grain for use in feeding the cattle and sheep, the chief factors in her live-stock industry. Argentina's production, however, is but about one-tenth that of the United States, her largest crop, that of 1912, having been but 296,000,000 bushels against 3,124,746,000 in the United States in that year. Mexico ranked third in 1912, with 190,000,000 bushels, and Hungary fourth, with 177,000,000 bushels.

Corn is utilized in the preparation of more than 100 different articles. Its chief value is as food for man and domestic animals. (See below.) The husks are used in making mattresses, especially in the corn-growing regions. The outer portion of the stalk is used in paper manufacture, and the pith is employed in making pyroxylin varnishes, guncotton, and other high explosives. Owing to its great resilience, porosity, and absorptive power, the pith has also been used in the construction of war vessels, compressed blocks of it being packed behind the outer armor plate to absorb the water and close the aperture in case the plate is pierced by a projectile. The cobs are often ground up for feed, but they are generally used for fuel and are also employed to a considerable extent in the manufacture of tobacco pipes. The principal and most common product of the grain is the flour, or corn meal, which is either white or yellow, according to the variety of corn from which it is made. Nearly all the starch and large quantities of glucose, whisky, and alcohol manufactured in the United States are made from corn. In connection with the manufacture of these various substances a number of by-products are obtained which are generally used for feeding purposes. (See GLUTEN MEAL AND GLUTEN FEED.) Maize or corn oil is obtained from the germ which is extracted from the kernel in the manufacture of starch, glucose (q.v.), and some kinds of meal. The oil expressed from the germ is a light, clear, amber-colored fluid, which may be used for culinary, mechanical, and lighting purposes. It is used to some extent in the manufacture of soap and for making a substitute for rubber.

Sweet Corn or **Sugar Corn** (*Zea saccharata*), generally considered a garden vegetable, is extensively grown in home gardens and for marketing and canning. As a vegetable, it is used while the kernels are plump and well filled out, but still containing milky juice. The ripened kernels have a wrinkled appearance. Sweet corn is adapted to any soil suitable for field corn, though more attention is given to manuring. A warm, rich, sandy loam is considered most desirable. On the northern limits of the corn belt sweet corn is grown as a field crop because of its rapid growing and early maturing habits. Some of the smaller and earlier sorts develop in 70 days; the later varieties require 90 to 100 days. According to the census, the amount grown for canning purposes in 1909 produced 7,451,265 cases, each containing two dozen two-pound cans. Corn for canning is grown mostly in Illinois, Maine, Iowa, New York, Ohio, and Maryland.

Popcorn (*Zea everta*) is characterized by small ears, seldom exceeding 6 inches in length and 1½ inches in diameter, small kernels, and an excessive portion of hard, flinty endosperm in the seed. This latter is supposed to give the property of popping, which is the complete turning inside out of the kernel on the application of heat, by the explosive expansion of steam formed (under pressure, owing to the hard wall of the kernel) from the minute quantities of water in the cells of the interior portion of the grain. Through popping the kernels become very much enlarged, so that a pint of kernels before popping makes six to eight quarts after popping. The popped kernels are pure white and are eaten out of hand, usually salted and often with the addition of a little melted butter, or mixed with sirup and pressed into balls or cakes to be eaten like confectionery. Popcorn requires about the same soil and treatment as field corn.

Feeding Value of Maize. Corn is of the greatest importance and is extensively used in the feeding of farm animals because of the variety and cheapness of feeding stuffs which it furnishes. The uncured plant in different stages of maturity is used as forage; corn shives (i.e., the stalks from which the pith has been removed) have recently been used to some extent; the ripened grain, whole or ground, is fed to all classes of farm animals, often on the cob and often ground with the cob as corn and cob meal; various by-products from the manufacture of starch, glucose, corn breakfast foods, etc., are also largely employed. As a food for man, corn is used cracked or crushed as hominy, and finely ground, both bolted and unbolted, as meal. From white corn, flour is made by grinding the grain after the removal of the germ and some of the outer envelope.

AVERAGE COMPOSITION OF A NUMBER OF CORN PRODUCTS

	Water	Protein	Fat	Nitrogen-free extract	Crude fibre	Ash
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Corn fodder (green)	79.3	1.8	0.5	12.2	5.0	1.2
Corn fodder (cured)	42.2	4.5	1.6	34.7	14.3	2.7
Corn stover	40.5	3.8	1.1	31.5	19.7	3.4
Corn silage	79.1	1.7	0.8	11.0	6.0	1.4
Corn shives	* 9.2	6.4	2.8	48.9	28.7	4.0
Corn kernel, dent	10.6	10.3	5.0	70.4	2.2	1.5
Corn kernel, flint	11.3	10.5	5.0	70.1	1.7	1.4
Sweet-corn kernel	8.8	11.6	8.1	66.8	2.8	1.9
Popcorn kernel (raw)	10.8	11.2	5.2	69.6	1.8	1.4
Popcorn kernel (popped)	4.3	10.7	5.0	77.3	1.4	1.3
Corn and cob meal	15.1	8.5	3.5	64.8	6.6	1.5
Hominy chop	11.1	9.8	8.3	64.5	3.8	2.5
Corn germ	10.7	9.8	7.4	64.0	4.1	4.0
Gluten meal	8.6	30.0	8.8	49.2	2.6	0.8
Starch feed (wet)	65.4	6.1	3.1	22.0	3.1	0.3
Corncob	10.7	2.4	0.5	54.9	30.1	1.4
Corn flour	12.6	7.1	1.3	77.5	0.9	0.6
Corn meal, granular	12.5	9.2	1.9	74.4	1.0	1.0
Corn meal, unbolted	11.6	8.4	4.7	73.0	1.0	1.3
Hominy	11.8	8.3	0.6	78.1	0.9	0.3
Sweet corn (green)	75.4	3.1	1.1	19.2	0.5	0.7
Cornstarch	13.3	1.2	† ..	85.1	† ..	0.4

* Dried artificially. † Trace.

The composition of these materials and some others mentioned later is shown in the table above.

Like all green crops, corn fodder has a high water content. It owes its nutritive value principally to the carbohydrates which it contains. It is also useful as a feeding stuff because it is succulent, gives necessary bulk to a ration, and is relished by animals. Dried corn fodder and stover are similar in composition to hay and are very valuable feeding stuffs, but unless cut fine or shredded and otherwise properly handled, a considerable portion may be wasted when fed. It often lacks flavor, and since it is chiefly a carbohydrate food, a one-sided ration, it should be fed with material rich in protein (i.e., concentrated feeds). Its palatability may be increased by moistening with water and sprinkling with bran and steaming. The best results are said to be obtained when only about one-third of the coarse fodder consists of stover. According to reports of the United States Department of Agriculture, the corn stover crop of the United States in 1904 was nearly 92,000,000 tons, much larger than the hay crop.

Corn silage, which resembles the green crop in composition, is wholesome and is relished by farm animals. The grain is especially rich in carbohydrates, principally starch, but contains considerable protein and some fat. Contrary to popular opinion, there is no marked difference in the composition and feeding value of white and yellow corn, or dent and flint corn. Individual specimens of either sort vary more widely than do the averages for the different groups. Corn is used in rations for maintenance, for the production of milk, for fattening, and for feeding draft animals. It is a universal feed for pigs in the United States, a bushel being considered sufficient, when fed alone, to produce on an average 11 pounds of pork. It is also widely used in fattening steers, beef cattle, and poultry, and is very satisfactory for the grain portion of a ration for horses, cows, and sheep. The commercial by-products like gluten meal are rich in protein and are valuable feeding stuffs. Corncobs possess considerable nutritive value, and when ground with the kernel the resulting meal is highly valued. Corn products compare favorably as regards digestibility with other similar feeding stuffs. The coefficients of digestibility of a number of them are on page 701.

Value of Maize as Food for Man. Corn ranks high in comparison with other cereal grains as a food for man. Large quantities are eaten in the United States, in southern and eastern Europe, and in the Orient, but it is little known in northern Europe. Corn meal, made into corn bread, mush, and many other foods, is wholesome and nutritious. It cannot be leavened with yeast like wheat flour in bread making, as the corn does not possess gluten, and the proteids of the maize kernel have other properties than those which characterize gluten. Large quantities of corn are consumed in the form of hominy and other breakfast foods. So far as experiments show, corn is well assimilated by man and, judged by composition, digestibility, palatability, and wholesomeness, is worthy of the high opinion in which it is held.

Green sweet corn, either fresh, canned, evaporated, or dried, commonly eaten as a vegetable in the United States, resembles other succulent vegetables in composition, being rich in carbohydrates. Popcorn, also widely used, closely resembles other varieties in composition, but after popping differs in composition from the raw chiefly in having a low water content. Cornstarch and corn oil, manufactured products, are used in cookery, the former extensively.

AVERAGE COEFFICIENTS OF DIGESTIBILITY OF A NUMBER OF CORN PRODUCTS

	Dry matter	Protein	Fat	Nitrogen-free extract	Crude fibre	Ash
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Corn fodder (green)...............	67.8	59.7	74.1	73.7	60.2	35.6
Corn silage......................	70.8	56.0	82.4	76.1	70.0	30.3
Corn stover......................	57.2	35.9	70.4	57.9	64.2	32.6
Ground corn shives...............	58.1	46.7	78.2	60.5	57.0	38.7
Corn meal........................	89.4	67.9	92.1	94.6	....	....
Corn and cob meal................	78.7	55.6	84.1	87.6	45.7	....
Corn cob.........................	51.4	19.3	...	48.3	57.5	....
Gluten feed......................	86.3	85.6	84.4	89.2	78.0	....

A disease (*pellagra*) has been attributed to the use of corn, which investigation seems to show is due to molding or spoiling of the grain. This has not been proved, and other theories are also held.

Bibliography. For the most practical references covering all phases of the subject, consult the publications of the United States Department of Agriculture, especially the farmers' bulletins; bulletins of the Division of Chemistry and of the Office of Experiment stations; Henry, *Feeds and Feeding* (Madison, Wis., 1898); also A. D. Shamel, *Manual of Corn Judging* (2d ed., New York, 1903); H. Meyrick (ed.), *Book of Corn* (2d ed., ib., 1904); Bowman and Crossley, *Corn* (Ames, Iowa, 1908); V. M. Shoesmith, *Study of Corn* (New York, 1910); F. H. Rankin, *Studies of Corn and its Uses* (4th ed., Urbana, Ill., 1912); E. G. Montgomery, *Corn Crops* (New York, 1913); Zeferino Dominguez, *Modern Cultivation of Corn* (San Antonio, Tex., 1914); Joseph Burtt-Davy, *Maize* (ib., 1914). See Colored Plate of CEREALS for illustration of *Zea mays*.

MAIZE BEER. See BEER; CHICA.

MAIZE OIL, or CORN OIL. See MAIZE.

MAIZEROY, mȧ′z′-rwä′, RENÉ, BARON (1856–). A French romancer who wrote under the nom de plume Maizeroy, the name of a branch of his family, though his own was Toussaint. He was born at Metz, was educated at the college of St. Clément, the Toulouse Lyceum, and the St. Cyr military school, whence he entered an infantry regiment as sublieutenant in 1877, resigning three years later to take up literature as a profession. He began with military subjects: *Souvenirs d'un Saint-Cyrien* (1880); *Le capitaine Bric-à-Brac* (1880); *Au régiment* (1885); *Amours de garnison* (1886); *La vie de soldat* (1887); *Souvenirs d'un officier* (1888); *Billets de logement* (1888). After a course of journalistic writing for the *Gaulois, Figaro, Gil Blas, La Vie Moderne*, and *Clairon*, he wrote many romances, such as the series entitled *Les amours défendues* (1884), another called *Les Parisiennes* (1883–90), and a third, *La grande bleue* (1888), which contains sea studies. His sketches of Parisian life include: *Les malchanceux* (1880); *Le mal d'aimer* (1882); *Celles qui osent!* (1883); *Petites femmes* (1885); *La fin de Paris* (1886); *Lalie Spring* (1887); *Des baisers du sang* (1898); and he also wrote plays such as *Le miroir* (1892) and *Papa la Vertu* (1899). Among his later novels are: *Le marchand de déesses* (1905); *La remplaçante* (1906); *Education amoureuse* (1908); *Mademoiselle* (1911); *L'Amour en danger* (1912).

MAJAGUA. See HIBISCUS.

MAJANO, BENEDETTO DA. See BENEDETTO DA MAJANO.

MAJANO, GIULIANO DA. See GIULIANO DA MAJANO.

MAJ′ENDIE, SIR VIVIAN DERING (1836–98). A British artillery officer and authority on explosives. He was born at Pipe Grange and was commissioned in the Royal Artillery in 1854, seeing active service in the Crimean War and winning the medal with clasps and the Turkish medal. He achieved further distinction in the Indian Mutiny and retired as colonel in 1882. In 1880 he was created Companion of the Bath and in 1895 Knight Commander. His service also included 10 years at Woolwich Arsenal, and in 1871 he was attached to the Home Office as Inspector of Gunpowder Works under the Gunpowder and Nitroglycerin acts. Largely instrumental in drafting the British Explosives Act of 1875, he was, on its being made law, appointed Chief Inspector of Explosives and held this office until his death. His bureau was charged with the supervision and regulation of the manufacture, storage, transportation, and importation of explosives in Great Britain, the object being so to safeguard the industry and its products as to reduce to a minimum the casualties attending it. The 22 annual and 50 special reports bearing Majendie's name have served as models to the officials of other countries in which such organizations have since been created.

MAJ′ESTY. See TITLES OF HONOR.

MAJLÁTH, moi′lät, JÁNOS. See MAILÁTH, JÁNOS.

MAJOLICA, or **MAIOLICA,** mȧ-jŏl′ĭ-kȧ *or* mȧ-yŏl′ĭ-kȧ (It., variant of *Maiorca*, Sp. *Mallorca*, Majorca). The name was at first applied to Hispano-Moorish lustred faïence brought into Italy from western Spain via Minorca, then to faïence made in Italy chiefly during the fifteenth and sixteenth centuries. The clay vessel was first fired, then coated with an opaque tin enamel, upon which the decoration was painted, and again fired. The lustre was a final coating of alkaline glaze to protect the design and increase the brilliancy of color. A native mediæval ware, covered with a simple slip, and with Gothic decorative motifs, had been manufactured in various parts of Italy during the thirteenth and fourteenth centuries. The Hispano-Moresque influence is first and chiefly apparent in the potteries of Florence of the early fifteenth century. The factory at Cafaggiolo, near Florence, which was active from the later fourteenth century for two centuries, produced a ware remarkable for deep blue and strong yellow glazes. During the later fifteenth and throughout the sixteenth century Faenza was the most productive and one of the most important centres. Its ware is especially known for its deep blue background; its most famous factory was the Casa Pirota. Deruta (near Perugia) produced a ware famous for its lustres; Urbino was known by its arabesque and grotesque decorations and figure compositions; while Gubbio was the great centre for lustres, not only for its own ware, but for those of all other potteries. The forms of the vessels are often refined, as in the jars painted with the names of medicaments and intended for the dispensary of the great monastery or of the ducal palace; as well as in certain vases and platters of more purely decorative character. The greater number of pieces are plates and dishes, often deep, and many of these have peculiar forms, as when a deep, almost hemispherical bowl is surrounded by a broad, flat marli, the whole upper side being painted in one design. The forms, however, are not more graceful nor do they involve more elaboration of design than in other far inferior wares; the painting, on the other hand, is altogether unique in the history of decorative art. In this way, while the forms were kept simple and on the whole severe, the painting grew more and more splendid in pigments and also nobler in composition, both in line and in color.

The decorations are of many types; thus, in one large round dish the whole surface will be covered minutely with arabesques and grotesques, derived, together with the animal and human forms mingled with them, from ancient Roman examples, and akin to those used by the painters of the school of Raphael in Rome. Another dish of about the same size may have but a single portrait head, perhaps of a lady, filling the whole disk, the colors being those of nature as nearly as obtainable, and a scroll with some laudatory or amatory motto forming a part of the background, between the convolutions of which a grave neutral color is worked in. Other similar plates or dishes have biblical or historical scenes treated freely and with reference in many cases to important mural paintings of the time. Again, others have the human figure nude, or nearly nude, studied from drawings or prints by artists of the same epoch, notably certain engravings of Marcantonio Raimondi, after designs by Raphael.

The introduction, about 1520, of lustre colors in imitation of the Hispano-Moresque wares added greatly to the brilliancy of the effect. The greatest master in such lustre painting was Giorgio Andreoli (q.v.), who possessed the secret of the ruby lustre, which died with him. His work is generally identified with the manufacture at Gubbio. The first half of the sixteenth century saw the highest development of the potter's skill, after which the art declined.

These splendid wares have been copied in modern times, especially in Italy, and with some success; but they have always obtained very high prices. Fine ancient pieces bring from $1000 to $10,000 for a single piece, the rate being governed mainly by the complex character of the design and the brilliancy of color. Rich collections of Italian majolica ware are to be found in the museums of Italy, particularly at Florence and in the provincial towns, and in the museums of London, Paris, Germany, and Austria. The finest in America, and indeed in the world, is that of J. Pierpont Morgan, now on loan in the Metropolitan Museum, New York.

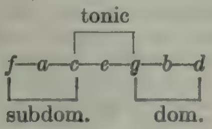
The term "majolica" is used by modern manufacturers for glazed hard pottery intended for use in decorative architecture, for garden seats and outdoor work generally. This ware is not often of much artistic merit. The forms are inferior and the colors are limited to those which will bear the greatest heat of the furnace, and which are therefore very resistant to external influences. In fact, for this purpose stoneware with glazes especially prepared for it is found to be a better material. See STONEWARE.

Bibliography. Darcel, *Recueil des faïences italiennes* (Paris, 1869); Drury and Fortnum, *A Descriptive Catalogue of the Maiolica, etc., in the South Kensington Museum* (London, 1873); Beckwith, *Majolica and Fayence* (New York, 1877); Meuer, *Italienische Majolikafliessen* (Berlin, 1880); Malajola, *Memorie storiche sulle maioliche di Faenza* (Bologna, 1880); Argnani, *Le ceramiche e maioliche faentine* (Faenza, 1889, 1903); Molinier, *La céramique italienne au quatorzième siècle* (Paris, 1899); Von Falke, *Majolika* (Berlin, 1896); C. D. E. Fortnum, *Majolica* (London, 1896); Henry Wallis, *Italian Ceramic Art* (ib., 1897); De Mauri, *L'amatore di maioliche* (Milan, 1899); Henry Wallis, *Oriental Influence on the Ceramic Art of the Italian Renaissance* (London, 1901); id., *The Maiolica Pavement Tiles of the Fifteenth Century* (ib., 1902); id., *Figure Design in 15th Century Maiolica* (ib., 1905); L. M. E. Solon, *History and Description of Italian Majolica* (ib., 1907); Wilhelm Bode, in *Jahrbuch der königlichen preussischen Kunstsammlungen*, vol. xxix (Berlin, 1908). Consult also the authorities referred to under FAÏENCE. Very beautiful single examples are given in chromolithography in Labarte, *Histoire des arts industriels* (2d ed., Paris, 1872–75), and in the Spitzer collection, edition in six folio volumes (Paris, 1890–92). See STONEWARE.

MA'JOR (Lat., greater), or MAJOR TERM. A name applied to the predicate of the conclusion of a syllogism (q.v.); it also occurs in one of the premises, which for this reason is called the major premise.

MAJOR (Lat. *major*, greater). The rank next above a captain and below a lieutenant colonel. In the United States the command appropriate to the grade is: infantry, a battalion; cavalry, a squadron; artillery, a battalion. See FIELD OFFICER; RANK AND COMMAND.

MAJOR. A term in music applied to intervals and modes. 1. All intervals which are not perfect are distinguished as major or minor. The former contains always one semistep more than the latter: c—e (5 semisteps) is a *major* third, c—e♭ (4 semisteps) a *minor* third. 2. The major mode is the one which is founded upon the major scale. This scale contains the major third and two semisteps between the 3 and 4 and 7 and 8. Thus: c, d, e, f, g, a, b, c. Modern music conceives a mode as a system of three fundamental chords which contain all the tones properly belonging to the scale of that mode. These chords are the tonic, dominant, and subdominant. In the major mode all these chords are major, i.e., they have the major third. The major scale, as represented by its fundamental chords, presents itself then in this form:



See MINOR.

MAJOR, CHARLES ("EDWIN CASKODEN") (1856–1913). An American lawyer and popular novelist, born at Indianapolis, Ind. He was educated in the common schools of Shelbyville and Indianapolis, studied law and practiced it at Shelbyville, his home. He first became known by his extraordinary popular success *When Knighthood was in Flower* (1898), which was followed by *The Bears of Blue River* (1901); *Dorothy Vernon of Haddon Hall* (1902); *Yolanda, Maid of Burgundy* (1905); *Uncle Tom Andy Bill* (1908); *A Gentle Knight of Old Brandenburg* (1909); *The Little King* (1910); *Touchstone of Fortune* (1912).

MAJOR, mà′yôr, GEORG (1502–74). A Lutheran theologian. He was born at Nuremberg and studied theology at Wittenberg under Luther and Melanchthon; was rector at Magdeburg and Eisleben; professor of theology and court preacher at Wittenberg in 1536; represented the Protestants in colloquy at Ratisbon in 1546. When the Schmalkald War broke out he left Wittenberg and was appointed superintendent and court preacher at Merseburg (1547), but at the close of the war he returned to Wittenberg. In 1551 he actively supported the doctrine of the Leipzig Interim, that good works are necessary to salvation, in opposition to the strict Lutherans, who denied that proposition. Amsdorf assailed him, declaring that good works are or may be detrimental to salvation. In consequence of the controversy Major removed to Wittenberg, and he died there, Nov. 28, 1574. Towards the close of his life he became involved in the Crypto-Calvinistic controversy. (See CRYPTO-CALVINISTS.) A portion of his works, comprising homilies and commentaries on the Gospels and Pauline Epistles, was published in 1569.

MAJOR, or **MAIR,** mâr, JOHN (1469–1550). A Scottish historian and scholar. He was born at Gleghornie, East Lothian; studied at Cambridge and Paris, and spent his life teaching alternately at Paris and in Scotland, mostly at Glasgow and St. Andrews universities, and preparing books for the press. He was a teacher of both John Knox and George Buchanan, but had no sympathy with the Reformation, though he desired ecclesiastical reform. He published many books, all in Latin, upon varied subjects, and is best known to-day by his *History of Greater Britain, both England and Scotland* (1521), which was the first attempt to write Scottish history in a critical spirit. Consult the translation prepared by Constable for the Scottish History Society (Edinburgh, 1892), which contains a life and bibliography.

MAJOR, RICHARD HENRY (1818–91). An English geographer, born in London. In 1844 he was appointed assistant in charge of the maps and charts of the British Museum, and in 1867 he became keeper of the maps and plans. From 1849 to 1858 he was honorary secretary of the Hakluyt Society, for which he edited, with translation, *Select Letters of Christopher Columbus* (1847, 1878), *Early Voyages to Australia* (1859), and several other valuable works. He was also honored by the vice presidency of the Royal Geographical Society. For his *Life of Prince Henry of Portugal* (1868), the *Bibliography of the First Letter of Columbus* (1872), and other publications on the early Portuguese and Italian discoveries, he was decorated by the rulers of Portugal, Brazil, and Italy. He died at Kensington, June 25, 1891.

MAJORANO, mä′yô-rä′nô, GAETANO. See CAFFARELLI.

MAJOR′CA (Sp. **MALLORCA,** mà-lyôr′kà). The largest of the Balearic Islands (q.v.). It lies 105 miles east-southeast of the mouth of the Ebro, the nearest point of the Spanish coast, and in the middle of the Balearic group, with Minorca on the northeast and the Pityusæ on the southwest (Map: Spain, G 3). Area, 1352 square miles. The coasts are nearly all rocky, rising on the northwestern side into steep, rough, and arid mountains, reaching a height of 4768 feet in Mount Torella. The south coast is lower and indented with bays, that of Palma affording a good harbor. The whole southern half of the island is finely diversified with hills and plains, which are fertile. There are extensive vineyards. The climate is healthful. The inhabitants, who resemble the Catalans in their appearance and manners, are hospitable and industrious, and mostly engaged in agricultural pursuits. The chief products of the island are marble, slate, plaster, the common cereals, oranges, silk, lemons, oil, wine of excellent quality, olives, and aromatic herbs. Pop., 1900, 248,194; 1910, 264,231. The capital is Palma (q.v.), situated on the south coast and connected by a railway with La Puebla and Manacor in the interior.

MA′JOR DO′MUS, or MAYOR OF THE PALACE. Originally the title of a royal steward under the Merovingian line of Frankish kings. His proper function was to be the overseer of all the royal estates; he was also at the head of the royal household, and consequently had authority over all who served in the palace. Soon the mayors came to preside over the royal courts of justice and to lead the army. There was a mayor for each of the Merovingian kingdoms of Austrasia, Neustria, and Burgundy. From 643 to 656 Grimoald was mayor of Austrasia, and on the death of the King tried to have his own son crowned King. He was put to death and Ebroin, mayor of Neustria, became powerful and tried to be the real ruler in all three kingdoms. He was assassinated. In 687 Pepin of Heristhal, who was mayor of Austrasia, after the battle of Testry, became ruler of Neustria also. Pepin was the founder of the Carolingian dynasty. (See CAROLINGIANS.) Both he and his son Charles Martel, who died in 741, were kings in everything but name. The latter's son, Pepin the Short, with the approval of the Pope, became King in name as well as in fact in 751. Consult Brunner, *Deutsche Rechtsgeschichte*, vol. i (Leipzig, 1906), and *Cambridge Medieval History*, vol. ii (New York, 1913).

MAJOR GENERAL. The highest grade in the United States army, the rank next above that of brigadier general. The command appropriate to his grade is a division or, in time of peace, a territorial department. In war he would command a division or a field army composed of two or more divisions, since the grade of lieutenant general (q.v.), formerly the highest, no longer exists in the United States army. See Rank and Command.

MAJOR′ITY (ML. *majoritas*, from Lat. *major*, greater). The period when the legal disabilities and the peculiar advantages and privileges incident to the status of infancy come to an end. A person upon attaining his majority has a last opportunity to disaffirm and avoid legal transactions to which he was a party during the period of his minority and which were voidable because of his disability. Certain privileges of citizenship usually commence at this time. As to the time when a person attains his majority and the privileges which it brings with it, see Age; as to the disabilities and privileges of minority, see Infant.

MAJOR PROPHETS. A name used of the prophets Isaiah, Jeremiah, Ezekiel, and Daniel and of the books of the Old Testament written by them, from the length of their writings. See Minor Prophets.

MAJU′BA HILL. A height of the Drakensberg, about 7000 feet above sea level and 2000 feet above the surrounding land, the northwest point of Natal, South Africa, a few miles northwest of Newcastle, overlooking Laing's Nek, an important pass in the Drakensberg, now followed by the Durban to Johannesburg railroad. It was the scene of the British defeat by the Transvaal Boers on Feb. 27, 1881. The British were surprised, and in the fight that ensued 92 British soldiers, including the commander, Gen. Sir G. P. Colley, were killed and about 150 wounded and taken prisoners. The loss of the Boers in killed and wounded was about 130.

MAKAROV, må-kä′rŏf, Stephen Ossipovitch (1848–1904). A Russian naval officer and scientist, born at Kiev. He entered the navy at 16, commanded an auxiliary cruiser in the Russo-Turkish War of 1877–78, and torpedoed several Turkish vessels. He also, as a naval volunteer, took part in the Turkestan campaign of 1881. Subsequently he carried on important hydrographic studies—in 1881–82 in the Black Sea and Mediterranean, in 1886–89 in the northern Pacific, and in 1894–96 both in the Mediterranean and Far Eastern waters. In 1898 he designed the ice-breaking steamer *Yermak*, in which he made a voyage to Franz Josef Land in 1901. In 1897 he became vice admiral and received command of the Baltic fleet, and from 1899 to 1904 was Governor of Kronstadt. Upon the outbreak of the Russo-Japanese War in February, 1904, he was appointed to the chief command of the Russian naval forces in the Far East, but was drowned on April 13 when his flagship, the *Petropavlovsk*, was blown up and sunk by a mine when coming out of Port Arthur. He wrote *Le vitiaz et l'océan pacifique* (1894), a work on naval tactics, and numerous papers on scientific and naval subjects. See Russo-Japanese War.

MAKART, mä′kärt, Hans (1840–84). An Austrian painter. He was born at Salzburg, May 28, 1840, and went to Vienna in 1858 to study at the Academy, but, dissatisfied with the prevailing methods, he returned after a few months to his native city. Through the munificence of the Prince-Archbishop von Tarnoczy he was enabled to study at Munich, chiefly under Piloty. He visited London and Paris in 1863 and soon after went to Rome with a stipend from the Austrian government. His first work to attract wide attention was the "Plague in Florence," a scene of voluptuous horror, which raised a storm of applause and intense adverse criticism. His "Abundantia" pictures (1870, New Pinakothek, Munich), representing the "Fruits of the Earth" and the "Fruits of the Sea," displayed even greater wealth of color than his former pictures. In 1869, after a prolonged stay in Italy, he settled in Vienna, where the Austrian state erected him a large atelier. In 1873 he completed "Venice Doing Homage to Caterina Cornaro," a colossal painting showing the influence of Tintoretto and Veronese, exhibited in Philadelphia in 1876, and now in the National Gallery, Berlin. The winter of 1875–76, which he spent in Egypt, suggested his "Cleopatra" (1875, Stuttgart Museum), "Antique Hunt on the Nile," and other Egyptian subjects. His most ambitious historical painting, "Entry of Charles V into Antwerp" (1875–78, Hamburg Gallery), for which he made special studies on a trip to Antwerp and Spain in 1877, was awarded a medal of honor at the Paris Exposition of 1878. The last of his larger compositions, "Diana's Hunting Party" (1880, Metropolitan Museum, New York), is one of his best works and is remarkable for its landscape surroundings. His remaining paintings include: "The Five Senses" (1879) and "Triumph of Ariadne" (Vienna Museum); "Summer" (1881, Dresden Gallery); "Spring" (1884), his last creation. Makart was appointed professor at the Academy of Vienna in 1879. He was preeminently a decorative genius, a brilliant improviser rather than a well-trained painter, a gorgeous colorist, but often weak in draftsmanship. His aim was the cult of sensuous beauty, but his riotous fancy lacked the sustaining power of an intellectual basis; all simplicity and repose are lost in his striving after effectiveness. Yet with all his shortcomings he was one of the most imaginative artists of modern times. He was the first to bring back the German school to the study and practice of color.

Consult: F. G. Dumas, in *Illustrated Biographies of Modern Artists* (Paris, 1882–88); Lützow, *Hans Makart* (Leipzig, 1886); Stiassny, *Hans Makart und seine bleibende Bedeutung* (ib., 1886).

MAKAW′. A small tribe of expert and daring fishers living about Cape Flattery, at the ocean entrance of Puget Sound, northwestern Washington. They are of Wakashan stock (q.v.), having apparently crossed over from Vancouver Island and conquered a territory for themselves on the southern mainland. In former times they were noted for their fierce and warlike character and still keep up their reputation as being among the most daring boatmen along the coast. The women are skillful basket makers. Many of the men have beards, which are said to be due to an admixture of white blood from the crew of a Russian vessel wrecked upon the coast about a century ago. They now number 360, are gathered upon a small reservation, and are fairly civilized.

MAKDALA. See Magdala.

MAK′EMIE, Francis (?–1708). The father of American Presbyterianism. He was born near Rathmelton, County Donegal, Ireland; studied at Glasgow; was licensed by the Presbytery of Laggan in 1681; and went the next year as missionary to Barbados. In 1683 he went to

Maryland and for several years combined commercial traveling with gospel preaching. In 1690 he was on the eastern shore of Virginia. From 1693 to 1698 he was in Barbados. In 1699 he organized the Presbyterian church of Snow Hill, Maryland, and other churches, and served as their pastor. In 1704 he went to London to appeal to the Presbyterians there for money and men. In this he was successful, and in 1706 the first "presbytery" met in Philadelphia. It was not a presbytery in the ordinary sense, however; rather "a meeting of ministers for ministerial exercises," and not subordinate to synod or assembly. On Jan. 19, 1707, he preached in a private house in New York City, Governor Cornbury having refused him permission to preach in the Dutch church. On January 21 he was arrested at Newtown, L. I., for preaching without the Governor's permission and imprisoned in New York till March 1, and then only released on bail. On June 3 he was tried in New York City and acquitted, because he produced his license to preach, received in Barbados, under the terms of the Toleration Act of William and Mary (1689), which was valid in all parts of the realm. Though acquitted he was condemned to pay costs of both defense and prosecution. He died in 1708 in Accomac Co., Va. Consult W. B. Sprague, *Annals of the American Pulpit*, vol. iii (New York, 1858), and C. A. Briggs, *American Presbyterianism* (ib., 1885).

MAKKARI, mäk′kȧ-rē, Ahmed el (c.1585–1631). A Moorish historian, born in Algeria. He was an active religionist and made two pilgrimages to Jerusalem, six to Mecca, and seven to Medina. Yet he found opportunity for the preparation of several works, of which the most important is the *History of the Mohammedan Dynasties of Spain* (in a partial English translation by Gayangos, 2 vols., 1840–43; edited as *Analects sur l'histoire et la littérature des Arabes d'Espagne*, Leyden, 1855–61).

MAKÓ, mŏ′kō. A town in Hungary, capital of the County of Csanád, situated on the right bank of the Maros, 19 miles by rail east of Szegedin (Map: Hungary, G 3). Its most prominent building is the palace of the Bishop of Csanád. The inhabitants are engaged chiefly in agriculture and stock raising. It manufactures bricks and agricultural machinery. There are also a number of oil presses in the town. Pop., 1900, 33,722; 1910, 34,918, largely Protestant Magyars.

MAKOLOLO, mä′kȯ-lō′lȯ. A branch of the Basutos or eastern Bechuanas of Bantu stock, who migrated northward about the year 1835 and subjugated their kinsmen, the Barotse, on the middle course of the Zambezi River in British South Central Africa. Livingstone was the first explorer to penetrate their country. Subsequently the Barotse overthrew their conquerors, massacred the men, and distributed the women and children among the tribes. The Makololo speech, however, was forced largely upon the Barotse by this very circumstance. The only political fragment of the once-powerful Makololo owes its preservation to the sending out of an embassy with Livingstone to the east coast to seek a cure for the King's leprosy, previous to the Barotse uprising. This party settled on the Shire River, below the falls, and has grown to be of some importance.

MAKREM′BOLI′TES. See Eustathius.

MAKRIZI, mȧ-krē′zē̇ (Ar. Aḥmad ibn ‘Alī Taḳī al Dīn al Maḳrizī). A Mohammedan historian (c.1364–1442). His surname, Makrizi, was taken from Makriz, a suburb of Baalbek, where his grandfather had originally lived. Makrizi spent the greater part of his life in Cairo, where he was born. He was taught in Hanafite schools, but joined the Shafiites in 1384. He journeyed to Mecca in 1385, and upon his return was appointed vice cadi and secretary. He then became successively prefect of police, preacher and teacher at various mosques. In 1408 he was sent to Damascus as curator of a hospital and professor at two different schools. He soon, however, retired to private life, giving himself up entirely to literary pursuits. The years 1430–35 he spent with his family in Mecca. Makrizi is our chief authority for the history and topography of Mohammedan Egypt, though he was not overscrupulous and quietly appropriated the works of other scholars. The most important of his works are: (1) *Al Mawâçiz wal-i‘tibār fi dhikr al-Khiṭaṭ wal-Athār*, a topographical history of Egypt, especially of Fostat and Cairo (ed. Bulak, 1854; French trans. by Bouriant, in the *Mémoires de la mission archéologique française du Caire*, 1895 et seq.); (2) *Al-Sulūk lima‘rifat duwal al-Mulūk*, a history of Egypt from 1181 to 1440 (*Histoire des sultans Mamelouks*, trans. by Quatremère, Paris, 1834–44); (3) *Al-Ilmān*, a history of Mohammedan rule in Abyssinia (ed. Rink, Leyden, 1790, and Cairo, 1895); (4) a treatise on Arabic weights and measures (ed. Tychsen, Rostock, 1800); (5) a treatise on Arabic numismatics (ed. Tychsen, Rostock, 1797, and Cairo, 1880; trans. by De Sacy, Paris, 1797). Consult Brockelmann, *Geschichte der arabischen Literatur*, vol. ii (Berlin, 1902).

MALABAR, măl′ȧ-bär. A district of the Madras Presidency, British India (Map: India, B., C 7). It borders the Arabian Sea for 150 miles, extending from lat. 10° 15′ N. to 12° 18′ N.; it is bounded by the native state of Mysore on the northeast and the native state of Cochin on the south. Anciently, under the name Kerala, it included also the district of South Kanara and the native states of Cochin and Travancore. The district of Malabar, 'the land of hills,' is one of the most beautiful and fertile districts of Madras. It has an area of 5795 square miles, exclusive of the few square miles of the politically attached Laccadive Islands. On the east are the Western Ghats, from 3000 to 8000 feet high, interrupted only by the Palghat Gap, 16 miles wide. The climate is fairly healthful, though very damp. In the low country the temperature seldom rises above 90° F. or falls below 70° F.; the mean annual temperature at Calicut is 81° F. The average annual rainfall is 116 inches. About 38 per cent of the total area is under cultivation, and of this about 60 per cent is planted to rice. Next to rice the most important crop is coconuts; other crops are areca nuts, plantains, pepper, cinnamon, ginger, tea, and various vegetables and pulses. In the strict sense famine is unknown, as the southwest monsoon never fails. The population is less agricultural than in other Madras districts, as many are engaged in fishing, fish curing, oil pressing, rice pounding, woodcutting, and the manufacture of palm-leaf hats and umbrellas. About one-third of the area is under forest. Mining at present is unimportant. The population (including that of the attached Laccadives) in 1871 was 2,261,250; in

1891, 2,652,565; in 1901, 2,795,738 (the increase in 10 years being 5.6 per cent); in 1911, 3,015,119 (7.8 per cent). In 1901, 68 per cent of the inhabitants were Hindu, 30 per cent Mohammedan, and 2 per cent Christian. More than one-third of the Mohammedans of the Madras Presidency are in the Malabar district. The prevailing language is Malayalam; about 4 per cent of the people speak Tamil. In 1901, 17.4 per cent of the males and 3 per cent of the females could read and write. The seat of administration is Calicut. Besides Calicut, the district has only six towns, Cochin, Cannacore, Palghat, Tellicherry, Ponnani, and Badagara. Malabar was ceded to the British in 1792, except the Wynaad taluk, ceded 1799. Consult: Williams Logan, *Malabar* (2 vols., Madras, 1887); Wigram and Moore, *Malabar Law and Custom* (ib., 1900); *Malabar District Gazetteer* (ib., 1908); Henry Bruce, *Letters from Malabar and on the Way* (New York, 1909). See Nairs.

MALABAR BLACKWOOD. An East Indian tree. See Dalbergia.

MALABAR COAST. A region of south India inhabited by people speaking the Malayalam language. Its northern limit is variously assigned, but it may be said to extend along the Arabian Sea from Cape Comorin to the northern boundary of the Madras Presidency, with the Western Ghats on the east (Map: India, C 7). It is thus included in the British districts of South Kanara and Malabar and the native states of Cochin and Travancore. The sandy coast is intersected by numerous inlets of the sea, some of which extend as lagoons for considerable lengths parallel to the coast, receive the various mountain streams, and communicate with the ocean by narrow shallow openings. Considerable inland navigation is carried on by native craft and light-draft coasting vessels. During the southwest monsoon of the rainy season (June to September), the sea obstructs the outlets of these lagoons and, swollen by the mountain torrents of the Ghats, they form backwaters which overflow the lowlands in all directions. When the waters recede and evaporate during the dry season the lowlands are cultivated and yield rich crops of rice. The mass of the people are of Dravidian stock, with customs, traditions, and castes of their own. (See Malayalim.) The chief seacoast towns include Mangalore, Cannanore, Tellicherry, Mahé (French), Calicut, Cochin, Mattancheri, and Trivandrum (2 miles from the sea).

MALABARI, măl'á-bä'rê, Behramji Maharbanji (or Merwanji) (1853–1912). An Indian social reformer and journalist, born at Baroda. He taught in a Parsi proprietary school; brought out his first volume of poems in 1875; and was proprietor and editor of the *Indian Spectator* from 1880 until 1900, when this publication was merged with the *Voice of India*. In 1901 he became editor of *East and West*. He devoted much of his life to bettering the condition of the women of India by advocating the abolition of child marriage and of enforced widowhood and by urging the passage of the Age of Consent Act of 1891. Gifted as a writer, he published: *The Indian Muse in English Garb* (1877), poems; *Gujarat and the Gujaratis* (1884); *The Indian Eye on English Life* (1893), an account of his visits to England; *The Indian Problem* (1894).

MALABARS. See Malayalim.

MALABÚYOC, mä'lȧ-bōō'yôk. A town of Cebú, Philippines, situated at the mouth of the Malutuoc River, on the Strait of Tañon, on the southwest coast of the island, 60 miles southwest of Cebú. Pop., 1903, 11,781.

MALAC'CA. A British territory on the southwest coast of the Malay Peninsula, forming a part of the Straits Settlements (Map: French Indo-China, D 6). Its area is about 708 square miles and it consists mainly of low, swampy land, rising towards the interior and producing rice, pepper, and sago. There are tin mines in the interior and tin is one of the principal exports. The capital is Malacca. There is cable connection with Singapore and Penang. The climate is 72° F. to 80° F. in shade, but the capital is fairly healthful. The territory has little attraction except for the sportsman and naturalist. Trade is entirely with Singapore and the Malay States. Revenue in 1910 amounted to $1,342,005. Trade in 1912 equaled $22,114,728. Rubber is now an important product and there are 35 companies with $15,000,000 capital. Para rubber, to the value of $10,353,914, was exported in 1912. Malacca is governed by a resident Councilor subordinated to the government at Singapore. Pop., 1891, 92,170; 1901, 95,487; 1911, 124,081.

MALACCA. The capital of the Territory of Malacca in the Straits Settlements, situated on the southwest coast of the Malay Peninsula, 125 miles northwest of Singapore (Map: French Indo-China, D 6). It was formerly an important commercial port, but has declined owing to the competition of Singapore. Pop., 1891, 16,502; 1901, 15,586; 1911, 21,213. The town was first taken by the Portuguese in 1511 and was later occupied by the Dutch. It became a British possession in 1824, in exchange for the British settlements in Sumatra.

MALACCA, Strait of. The body of water which separates the Malay Peninsula on the northeast from the island of Sumatra on the southwest and connects the Bay of Bengal with the South China Sea (Map: Asia, M 8). Its length is 500 miles and its breadth varies from 50 miles at the southeast to 250 miles at the northwest extremity. Its narrow end is filled with a number of large and small islands, on one of which is the British settlement of Singapore.

MALACCA CANE. A species of cane (*Calamus scipionum*), used in the manufacture of walking sticks. It is imported from Sumatra.

MALACCA WEASEL. A civet. See Rasse.

MALACHI, măl'á-kī (Heb., my messenger). Commonly regarded as the name of the author of the last book of the Minor Prophets in the Jewish canon of the Old Testament. The Greek version, however, read "by the hand of his messenger," and the Targum "by the hand of my messenger whose name is called Ezra the scribe." It is probable that Malachi is neither a proper name nor an appellative of the author of the book, but that it was taken by some editor from iii. 1 and made the title of a book that had no author's name prefixed. The prophecy of Malachi is therefore anonymous. The book falls into two divisions: (*a*) a general presentation of the main theme, followed by a rebuke to the priests (i–ii. 9), and (*b*) a rebuke of the people with occasional references again to the sins of the priests (ii. 10–iv. 6). After a brief introduction emphasizing Yahwe's love to Jacob as proved by his hatred of Esau indicated by its lot, the prophet addresses the priests, rebuking them for their heartless, mercenary, and corrupt services and especially for their allowing inferior or unclean offerings to be presented on the altar. He threatens them with judgments if they persist in their sins, and describes the character of a true priest in contrast with their own. The second part consists of a series of oracles addressed to all the people, who are rebuked for their marriages with the Gentiles and their rejection of the lawful wives of their youth, who were left to weep at the altars of Yahwe. It is maintained by some scholars that this rebuke of unlawful marriages is a simile for the disloyalty of the people towards Yahwe, but the interpretation is forced. The prophet continues by the announcement of the sudden coming of Yahwe, whom the people claimed to seek, but who, in an unexpected coming, would sit in judgment against all transgressors, supplying by His own omniscience swift testimony against them. This represents the prophet's answer to those who declared that Yahwe did not concern Himself with the affairs of the individual. He calls the people to repentance, with the promise of abundant blessings to all who obey. To those who already fear Yahwe he gives the assurance that they shall always be precious in His sight, and closes with the renewed announcement of the appointed judgment, before which great and dreadful day Elijah, the prophet, will come calling fathers and children to repentance as the only way of avoiding the hastening doom. He is also the messenger of Yahwe who will come to purge the Levitic priesthood so that they may offer clean and acceptable sacrifices to Yahwe. The Book of Malachi is a production of the Persian period. The Exile lies in the past and is not even referred to. The temple has been rebuilt and the cult is regularly carried on, but a spirit of religious indifference prevails among priests and people. Mixed marriages are still going on, and the priests use their sacred office for personal aggrandizement. The people, too, are not conscientious in paying their tithes (iii. 8–12). We are therefore transported by this book to the first half of the fifth century B.C., when the evils described, which ultimately led to internal conflicts terminating in the division of the people into several parties, were beginning to set in. This date is also indicated by the recent expulsion of the Edomites from their mountain home by the Nabatæans. The diction of the Book of Malachi is more prosaic than the earlier prophetical discourses and has some pecularities that are regarded as marks of a late date. The style is vigorous without approaching in vividness some of its predecessors. The book is referred to no less than four times in the New Testament (Mark i. 2, ix. 11; Luke i. 17; Rom. ix. 13). Consult, besides the general works on the Minor Prophets, especially the commentaries of G. A. Smith, Nowack, Wellhausen, Marti (1904), and Van Hoonacker (1908); Köhler, *Der Prophet Maleachi* (Erlangen, 1865); J. J. S. Perowne, "The Book of Malachi," in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1889); Torrey, in the *Journal of Biblical Literature* (Boston, 1898); S. R. Driver, "Malachi," in the *Century Bible* (London, 1906).

MALACHITE, măl'ȧ-kīt (from Lat. *malache*, Gk. *μαλάχη, mallow;* so called from the color). A basic cupric carbonate that crystallizes in the monoclinic system. It is of a bright-green color and is commonly found massive, though sometimes in botryoidal or stalactitic forms. Malachite occurs with other ores of copper, frequently as a product of their alteration, and is found in the Ural Mountains, in Tirol, at various localities in France, and elsewhere throughout the world. Specimens in fine mass with acicular crystals occur at Bisbee and Morenci, Ariz. It has long been highly prized as a gem and ornamental stone, especially in Russia, where it is used for inlay work, mantels, table tops, and paneling.

MALACHITE GREEN. See COAL-TAR COLORS.

MALACHOWSKI, mä'la-kôf'skė, STANISLAUS HALENCZ, COUNT (1736–1809). A Polish statesman. He was born at Konskie; became president of the royal court of justice and deputy to the Coronation Diet of 1764; and in 1788 was chosen president of the Four Years' Diet. The chief framer of the constitution of 1791, upon its failure the next year he left the country, subsequently settling on his estates in Galicia. He reëntered politics in 1807; and, when the Grand Duchy of Warsaw was created, he became President of the Senate under the new government of the King of Saxony, Frederick Augustus. His death was greatly mourned by the Poles.

MALACHY, măl'ȧ-kī, SAINT (?1094–1148). An Irish prelate and reformer. He was born probably in Armagh, of the noble family of O'Morgair, educated by a hermit named Imhar O'Hagan, and ordained priest in 1119. He made further studies at the famous school of Lismore, but returned to Armagh to throw himself heartily into the movement for the reformation of the Celtic church. He was chosen Bishop of Connor in 1124. When Celsus, Archbishop of Armagh, was dying, he charged his clergy and people not to elect, according to the prevalent custom, a member of his family, but to choose Malachy. The election was disputed by a kinsman of the late prelate, and it was not till five years later, in 1134, that Malachy was able to enter into undisputed possession of his see, which, however, he resigned in 1137 to return to his former diocese, which he divided into Down and Connor, retaining the former. He still retained a great influence over the development of the whole Irish church. He visited Rome during the pontificate of Innocent II, stopping on his way at Clairvaux, where he made the acquaintance of his future biographer, St. Bernard. The Pope invested him with extraordinary powers as legate in Ireland. Leaving home once more in 1148 to visit Pope Eugenius III at Clairvaux, he died in the arms of St. Bernard, was buried at Clairvaux, and was canonized in 1189.

A singular document passes under the name of the *Prophecy of Saint Malachy*, which professes to give a list of 141 appropriate mottoes for all the popes from 1143 to the end of time. St. Bernard, though he ascribes to Malachy the gift of prophecy, mentions nothing like this; and no earlier date for its existence can be authenticated than 1595, in which year it was printed at Venice. As a matter of fact, however, the mottoes for popes later than that date are often singularly appropriate, either to the character, history, or sometimes to the armorial bearings of the various pontiffs. Thus, that of Pius VI was *Peregrinus apostolicus;* Pius VII, *Aquila rapax;* Pius IX, *Crux de cruce*—the cross of Savoy was indeed a heavy cross to him; Leo XIII, *Lumen in cœlo*—the "light in heaven" has been referred both to the general enlightened policy of his reign and to a blazing comet which appears in chief in his family arms; Pius X, *Ignis ardens;* Benedict XV, *Religio populata.* The few remaining mottoes are: *Fides intrepida; Pastor angelicus; Pastor et nauta; Flos florum; De medietate lunæ; De labore solis; Gloria olivæ.* "Then," the prophecy concludes, "a second Peter shall sit upon the seven hills, and Christ shall return to judge the world by fire." For further details, consult: O'Brien, *Historical and Critical Account of the So-Called Prophecy of Saint Malachy* (Dublin, 1880); Lord Bute, "On the Prophecy of Saint Malachy," *Dublin Review* (ib., 1885); his *Life* by O'Hanlon (ib., 1859) and O'Laverty (Belfast, 1899).

MAL'ACOL'OGY (from Gk. *μαλακός, malakos,* soft + *-λογία, -logia,* account, from *λέγειν, legein,* to say). The science or study of mollusks as animals, in distinction from conchology, which considers only, or mainly, their shells. See Mollusca.

MALACOPTERYGII, măl'ȧ-kŏp'tēr-ĭj'ĭ-ī, or **MALACOP'TERI** (Neo-Lat. nom. pl., from Gk. *μαλακός, malakos,* soft + *πτερύγιον, pterygion,* dim. of *πτερόν, pteron,* wing, fin). One of the two primary divisions of osseous fishes in the system of Cuvier, distinguished by soft or spineless fins, the rays of which are jointed. (See Fin.) The cod is an example. The signification has been modified by Müller, Owen, and others, and the term is now little used. Compare Acanthopterygii.

MALACOS'TRACA (Neo-Lat. nom. pl., from Gk. *μαλακός, malakos,* soft + *ὄστρακον, ostrakon,* shell). One of the major divisions of class Crustacea, Phylum Arthropoda, usually accorded the rank of a subclass; lobsters, crabs, and shrimps are familiar examples. The Malacostraca are usually large organisms, distinguished by a definite and constant organization of the body in three parts: head, thorax, and abdomen. The head comprising five segments bears two pairs of antennæ, one pair of mandibles and two pairs of maxillæ, in addition to the eyes which are paired, and are borne on stalks in the higher orders. The thorax is composed of eight segments, bearing appendages for progression, typically forked; from one to five of the anterior pairs are converted into accessory mouth parts (maxillipeds). The abdomen consists of six segments with limbs, and a tailpiece (telson), although in one order (Phyllocarida, example *Nebalia*) a seventh segment devoid of limbs precedes the telson. The eggs are usually heavily laden with yolk; the larva is rarely a free-swimming nauplius as it is in the more primitive Entomostraca (q.v.). See Crustacea.

MALADE IMAGINAIRE, mȧ'lȧd' ē'mȧ'zhē'när' Lε, (the imaginary invalid). A five-act prose comedy by Molière, produced at the Palais Royal in 1673.

MALAGA, *Sp. pron.* mä'lȧ-gȧ (ancient *Malaca*). The capital of the Province of Malaga in the former Kingdom of Granada, Spain. It is situated at the head of a small bay of the Mediterranean Sea, 64 miles northeast of Gibraltar (Map: Spain, C 4). It is picturesquely located on a fertile plain, amid gardens and vineyards, and surrounded on three sides by mountains. The climate is remarkably dry and equable, the place being protected from the north winds by the mountains and enjoying the tempering influence of the sea breezes. It is a straggling, irregularly built town, with narrow, crooked, and unclean streets and has few interesting features. The old portion is built at the foot of the steep hill of Gibralfaro, surmounted by a Moorish castle, which dates from the thirteenth century and is about the only relic of past times still preserved. The newest portions of the town are more attractive. Near the harbor is a handsome, broad promenade, the Alameda, shaded by fine trees and ending at a beautiful fountain. There are several new avenues laid out along the water front, and the residential district of the Caleta is pretty and well kept. The cathedral is a vast structure of a mixed style of architecture, chiefly Gothic, but very imposing, dominating the whole view of the town from the sea. There is a large bull ring. The intellectual life is centred in the lyceum of literature and art, with a good library and picture galleries. The harbor, which was formerly obstructed, has since 1892 been improved, and there is considerable trade in sugar, wine, oil, lemons, and other agricultural products. There are manufactures of soap and chemicals, ropes, leather, and cloth, as well as several large iron foundries, sugar refineries, and distilleries. Pop., 1887, 134,016; 1900, 131,063; 1910, 136,365.

In ancient times Malaga was an important Phœnician, and later a Carthaginian, colony. Under the Romans, and especially under the Moors, it developed into a strong military station. It was captured in 1487 by Ferdinand and Isabella, after an heroic resistance. The French sacked the city in 1810.

MAL'AGAS'Y. See Madagascar.

MALAGASY SUBREGION. In zoögeography, a subdivision of the Paleotropical or Ethiopian Region, embracing Madagascar and the Comoro, Seychelle, Mascarene, and neighboring islands. This insular subregion is so different in its fauna from the African continent, and has so much that is exclusive, that some zoölogists have placed it in the first instead of the second rank of zoögeographical divisions. Haeckel, indeed, regarded it, theoretically, as the relic of a former hypothetical continent, or archipelago, Lemuria (q.v.), which extended eastward into the Malayan islands. Its extent was supposed to be indicated by the present distribution of the lemur family, but more recent knowledge in regard to the past distribution of this family, derived from fossil remains, shows that the hypothesis is untenable. This theory indicates, however, the most prominent characteristic of the fauna of Madagascar, which is that it is the headquarters of the lemur tribe. Nearly all the other lemurs known (except the African galago) are Malayan, and this fact, together with various other coincidences, leads to the conclusion that there was once some intercommunication. The isolation of Madagascar must, however, have occurred very long ago, even as time is reckoned in paleontology, for the differences between it and Africa are almost as great as those between it and the Orient. Very deep water separates it from Africa, and there could have been little if any interchange of terrestrial life since a very remote period. Its mammalian fauna is rich in lemurs and insectivores—all small animals of ancient types. The only ungulate is a peculiar species of river hog, for none of the antelopes and the like of Africa live there. There are very few and small rodents, and none of the great carnivores; the beasts of prey are altogether of the civet family, the largest of which is the ferocious fossa (q.v.), which is about twice the size of a house cat. In every case the species is peculiar to the island, and in most cases the genus also. Birds are extremely numerous, and on the whole are Ethiopian in character; but many genera and species are wholly restricted to this subregion. Here, too, was the home of many recently extinct birds, such as the epiornis, a relic of an ancient Notogæan tribe, the dodo, solitaire, and so on. (See Bird, Fossil; Extinct Animals.) The reptiles present many purely local forms and curious resemblances to the faunæ of other regions. Of the great colubrine family of snakes, none is of the African type, nor is there a viper; on the contrary, several genera are the same as or similar to those of America. The boas, so characteristic of South America, are represented by Malagasy species, and also the tree snakes (Dendrophidæ); while several families mainly Oriental are represented here (e.g., see Langaha). A similar mixture of types may be found among Malagasy lizards and chelonians—the latter including in the Mascarene Islands the once numerous and very ancient giant tortoises. (See Extinct Animals.) No other part of the world seems to have possessed, when first investigated by Europeans, so many senescent species, most of which have succumbed to civilization. The amphibian fauna of Madagascar has only recently been studied and has been found equally remarkable with the rest, so that Gadow makes it one of the four primary subdivisions of the Southern Hemisphere of the Old World (his "Notogæa"; consult *Amphibia and Reptiles*, London, 1901). There is a mixture of African and Indian forms. The island differs from Africa by the absence of Apoda (limbless batrachians), Aglossa (tongueless frogs), and Bufonidæ (toads). It differs from the Oriental Region in similar absences of certain groups, and has several exclusive forms of its own. Fresh-water fishes and the invertebrate life are not well known, but seem to bear out the former deduction that Madagascar has a fauna which has been very long isolated, and was originally derived from sources which contributed to both Oriental and Ethiopian regions. See Distribution of Animals, and the accompanying maps.

MALAGUETTA (mä'lȧ-gĕt'tȧ) **PEPPER.** See Guinea Pepper; Grains of Paradise.

MALAKANI, mä'lȧ-kä'nė. See Molokani.

MALAKASTEUM. See Osteomalacia.

MALAK'KA. See Malacca.

MALAKOFF, Duke of. The title of Aimable Jean Jacques Pelissier (q.v.), Marshal of France.

MAL'ALAS (Lat., from Gk. Ἰωάννης ὁ Μαλέλα, or Μαλάλα (*Iōannēs ho Malela* or *Malala*), John the Orator, from Syr. *malālā*, eloquent, from *malel*, to speak), Johannes (c.491–578). A Byzantine chronicler, of whose life little is known. His fame is due to the fact that he wrote a chronicle in 18 books, not addressed to scholars but intended for the use of the unlearned. It was popular and was frequently copied during the next five centuries. The beginning and end of the work have been lost, but the part which we have begins with mythical times and extends far enough to include some of the events which happened in Malalas' lifetime. Consult, for the various editions and for bibliography, Krumbacher, *Geschichte der byzantinischen Litteratur* (2d ed., Munich, 1897).

MALAMPAYA (mä'läm-pä'yȧ) **BAY,** or Sound. An inlet of the China Sea, on the northwest coast of the island of Palawan, Philippines (Map: Philippine Is., B 5). It is one of the finest natural harbors in the archipelago. Its narrow entrance can be protected from the rocky headlands on either side, and within is a landlocked harbor, 9 miles long by 4 miles wide, with depths ranging from 36 to 54 feet.

MALAN, mȧ'län', César Henri Abraham (1787–1864). A Protestant divine, born in Geneva, Switzerland. He was educated at the academy in Geneva; was ordained to the ministry of the national church in 1810; and became preacher to the cathedral and a regent of the academy. He preached the Socinian views which prevailed in the Swiss church at the time, till, in 1816, under the influence of American and Scottish friends, he accepted the Trinitarian doctrine. The promulgation of his new faith exposed him to the censure of the authorities and he was excluded from the cathedral pulpit in 1818. After preaching in his own house for a time he became pastor of an independent church called La Chapelle du Témoignage, and was for many years a conspicuous figure in the Protestant life of central Europe. In 1828 he was dismissed from the pulpit of the national church, because he persisted in preaching doctrines not generally accepted. He founded a theological school at Geneva and introduced Sunday schools into Switzerland. He visited almost every country in Europe and became famous as an itinerant preacher. He published a book of hymns, *Les chants de Sion* (1826; with original music, 1841); *Les Mômiers, sont-ils invisibles?* (1828); *Le témoignage de Dieu* (1833); *L'Eglise romaine*, which was published in English in New York in 1844; *Les grains de sénevé* (1846). His *Life* was published by his son, Solomon César Malan, in Geneva in 1869 and translated into English in the same year.

MALAN, Solomon César (1812–94). A British Orientalist, born at Geneva, Switzerland. He graduated from Oxford University in 1837, having specialized in the study of Sanskrit, Arabic, Hebrew, and other languages. He then served until 1840 as a lecturer at Bishop's College, Calcutta; while there he gained a knowledge of the Tibetan and Chinese languages. After holding several other charges, he was curate at Broadwindsor, Dorset, from 1845 to 1886. He made many translations from the Armenian, Coptic, and Georgian. The University of Edinburgh gave him the degree of D.D. in 1880.

MALANGA, mȧ-läṉ'gȧ. See Dasheen.

MAL'APROP, Mrs. (Fr. *mal-à-propos*, not to the purpose). A character in Sheridan's play *The Rivals* (1775), who has a ludicrous habit of using wrong words which resemble the right ones more or less; as when she speaks of a person as "a *progeny* of learning," or of "an *allegory* on the banks of the Nile."

MALAP'TERU'RUS (Neo-Lat., for **malacopterurus*, from Gk. *μαλακός*, *malakos*, soft + *πτερόν*, *pteron*, wing, fin + *οὐρά*, *oura*, tail). A genus of African catfish (q.v.), in which in place of a free dorsal fin there is a soft fatty fin near the tail. Two species are known, viz., *Malapterurus electricus* and *Malapterurus beninensis*, both remarkable principally for their electric organs and properties. See Electric Fish.

MÄLAR, mȧ'lär, or **MAELAR.** One of the largest and most beautiful lakes in Sweden, stretching for 70 miles westward from Stockholm, with a breadth of from 2 to 23 miles and an area of about 450 square miles (Map: Sweden, F 7). Its waters are nearly on a level with the Baltic Sea, into which they are discharged by channels running through and around the city of Stockholm. A canal connects it also with Lake Hjelmar. The lake contains over 1200 islands, and the scenery along its shores is much varied with wood, lawn, and cliffs, and adorned with castles, country seats, and villas. The surrounding country is fertile and populous, and upon the shores stand the towns of Enköping, Vesterås, Strengnäs, and a number of villages.

MALA'RIA (from It. *mal' aria*, bad air, from *mala*, fem. sing. of *malo*, from Lat. *malus*, bad, and *aria*, from Lat. *aer*, from Gk. *ἀήρ*, air, from *ἄειν*, *aein*, to blow) and MALARIAL FEVER. This disease was until recent years regarded as a poisonous emanation (whence the name) from the soil of certain localities, but is now definitely known to be one of the specific infectious diseases and to be caused by an animal parasite peculiar to the blood of man and mosquitoes—the *Plasmodium malariæ*. This parasite, discovered in 1880 by Laveran (q.v.), belongs to a class of protozoa called *hemocytozoa* or *hemosporidia*, which attack and develop in the red blood corpuscles of animals, birds, and fish, and of which numerous species are known. In the human blood several varieties of the parasite have been distinguished, each associated with a definite type of fever. These are the parasites of tertian, quartan, and æstivo-autumnal fever, named by Schandinn *Plasmodium vivax*, *Plasmodium malariæ*, and *Plasmodium immaculatum* respectively. The æstivo-autumnal form has two varieties, the quotidian and the tertian. It was first pointed out by Golgi that the tertian and quartan parasites exist in the blood in great groups, all the members of which are at approximately the same stage of development. An entire group, for example, undergoes sporulation within a few hours' time, and this sporulation is always accompanied by the malarial paroxysm. The tertian parasite requires about 48 hours to accomplish its life cycle and produce spores; the quartan about 72 hours; so that in a single infection with one or the other of these parasites we observe the characteristic malarial paroxysm on every third and every fourth day respectively. Double infection, i.e., the introduction of two separate groups of parasites at different times, may occur, however, and produce daily paroxysms or attacks on two successive days, with a day's intermission, etc. The exact duration of the life cycle of the æstivo-autumnal type of parasite is less definitely understood. Sporulation may occur at irregular intervals, or may take place continuously, and the resulting fever is correspondingly irregular and sometimes almost continuous. The plasmodium may be observed in the blood of individuals suffering from an attack of malarial fever, lodged in the red blood corpuscles. It is essentially a parasite living upon and within these cells. It begins its life cycle as a small round or oval hyaline amœboid body. The tertian variety is the largest and is about the size of a red corpuscle ($\frac{1}{3200}$ of an inch in diameter). The æstivo-autumnal variety is less than half that size, the quartan somewhere between the two. The red corpuscles attacked become expanded or shrunken and decolorized, and the pigment collects in clumps of granules. Later on long, active processes called *flagella* develop from the full-grown parasite and move about freely in the blood. These are believed to be the sexual elements.

Of the 50 or more species of mosquitoes belonging to the genus *Anopheles*, the following, according to Craig, have been shown experimentally to transmit the disease: In Africa, the *A. costalis*, *A. paludis*, *A. funestus;* in India, *A. sinensis*, *A. Rossii*, *A. culicifacis*, *A. Theobaldi*, *A. barbirostris;* in Europe, *A. superpictus*, *A. maculipennis*, *A. bifurcatus;* in America, *A. maculipennis*, *A. argyrotarsus*. Walker and Barker, of the Bureau of Science at Manila, announced in 1914 the discovery of a mosquito of a different variety from that usually carrying malaria, which had caused unexplained epidemics in the archipelago. This mosquito they named *Myzomia febrifera*. Bass and Johns in 1912 succeeded in cultivating the plasmodium in human serum and ascitic fluid.

Individuals who have suffered from repeated attacks of malaria, especially if the disease has not been properly treated, fall into a peculiar state called malarial cachexia, the characteristic symptoms of which are a greatly enlarged spleen and more or less severe anæmia. Sufferers from this condition have a peculiar yellowish or grayish color of the skin; there are loss of appetite, diarrhœa, emaciation, and general nervous exhaustion. The condition is especially frequent in children living in the tropics.

That insects might be the means of transmitting malaria was suggested nearly 2000 years ago by Varro and Columella. Nott in 1848 was satisfied with the fact, but King, of Washington, in 1882, was the first to advocate the theory effectively and to marshal the evidence in its favor. Laveran also in 1884 supported his contention, and in 1894 Manson stated his belief that malaria was transmitted only by the mosquito. A year later Ross, of the Indian Army Medical Service, observed the development of the æstivo-autumnal parasite in the body of the mosquito. In 1898 Bignami began inoculation experiments, and finally succeeded in producing an attack of malaria in man by means of infected mosquitoes. Bignami's experiments were with the æstivo-autumnal parasite. Simultaneously Bastianelli, Bignami, and Grassi transmitted a double tertian infection in man through the bite of an infected mosquito. Until the truth of the mosquito theory was established the only protection against malaria was quinine. Now, however, a much more effective defense is possible for those compelled to live in malarious districts. This consists in shielding themselves from the bites of mosquitoes, especially at night, by the use of nets and screens; in waging a constant warfare upon the insects by draining stagnant pools and marshes where they breed; and in destroying their larvæ by the liberal use of petroleum during the malarial season. See INSECTS, PROPAGATION OF DISEASE BY.

Malaria has a wide geographical distribution. No continent is entirely free from it, and certain parts of the tropics are practically uninhabitable by reason of the severe types of fever which prevail. In Africa the west coast is the worst district. In Asia many portions of India, especially along the valleys of the Ganges and Indus rivers, and parts of China and Persia, are malarious. In Europe the disease prevails in Holland, North Germany, the west coast of Italy, and the fen districts of England. In North America it occurs chiefly along the lower Atlantic seacoast and in the Gulf States. The disease is always associated with warm, marshy soils, estuaries, badly drained low-lying districts, and tracts of land rich in vegetation, which offer suitable breeding places for the mosquito.

A typical attack of malaria, or paroxysm, is characterized by three well-defined stages. The *cold* stage is preceded by a headache, yawning, and general malaise; gradually the patient begins to shiver, and in the height of the chill shakes violently. The temperature rises to 102 or even to 105 or 106 degrees. This stage lasts from 10 minutes to an hour, and is followed by the hot stage, during which the coldness of the surface disappears and the skin becomes flushed. In from one-half to three or four hours the *sweating* stage sets in. Beads of perspiration appear on the forehead, and the whole body is bathed in a copious sweat. The fever and headache disappear, and within an hour or two the patient sinks into a sleep and the paroxysm is over.

In the pernicious form of malaria which occurs in the tropics and is always associated with the æstivo-autumnal parasite, the attack is sudden and violent, with intense cerebral disturbance, either delirium or coma. This form is generally fatal. The only remedy which can be relied on in this disease is quinine, which may be regarded as a specific. Large doses have sometimes to be given in the severer types of the affection. For the profound anæmia following long-continued infections, iron and arsenic are given.

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MALASPINA, mä′lȧ-spē′nȧ, SABA. An Italian historian, chancellor under Pope John XXI. He was of the same stock as Ricordano Malaspina (c.1200–81), the author of an *Istoria fiorentina;* and wrote *Res Siculæ*, dealing, from the side of the Guelphs, with the period between 1250 and 1276.

MALASPINA GLACIER. One of the largest of the remarkable group of Alaskan glaciers, a great plateau of ice formed by the confluence of several valley glaciers that flow down the slopes of the St. Elias Alps. With its tributaries, which include Seward Glacier on the east, Agassiz in the centre, and Tyndall and Guyot on the west, it covers an area of 1500 square miles and has a front along Yakutat Bay and the Pacific of 70 miles. Its surface is undulating or broken, traversed by streams in summer, and its margins are heavily mantled with morainal material in which nestle many lakes. The marginal moraines are partly forested, although beneath there is 1000 feet or more of solid ice. The ice flows southward and as it meets the sea it breaks off in great masses that float away as bergs, to the danger of navigation.

MALATESTA, mä′lȧ-tĕs′tȧ. The name of an Italian family settled in the Romagna. The principal branch of the family ruled in Rimini, which they entered in 1216; in 1237 Giovanni was elected podestà; in 1247 Malatesta de Verrucchio succeeded him and after various vicissitudes became supreme ruler after 1295. He was an active Guelph partisan, as was his son and successor, Malatestino, who annexed Cesena. One of his brothers, Giovanni, was the husband of Francesca da Rimini, daughter of Guido da Polenta, the pathetic story of whose love for Giovanni's brother, Paolo, is told in Dante's *Inferno.* Malatestino's brother, Pandolfo I, succeeded him and continued the traditional policy of his family in supporting the Pope against the Ghibellines. During the Renaissance the family was among the most powerful in Italy. It was connected by marriage with the houses of Urbino and Montefeltro, and it had possession at one time of Bergamo and Brescia. Perhaps the most celebrated of this family is Sigismondo, who died in 1468. He was a patron of artists and authors, the founder of a library at Rimini, and a skillful general, who fought for himself as well as for Venice, Naples, Siena, Florence, and Aragon. He made war upon the Pope and was excommunicated in 1460. He was a son-in-law of Francesco Sforza. The last Malatesta who was Lord of Rimini was Pandolfo IV, who sold Rimini to the Venetians in 1503. Consult: C. E. Yriarte, *Un condottiere au quinzième siècle* (Paris, 1822); Edward Hutton, *Sigismondo Pandolfo Malatesta, Lord of Rimini: A Study of a Fifteenth Century Italian Despot* (London, 1906).

MALATIA, mä′lȧ-tē′ȧ. The capital of a sanjak and a garrison town in the Vilayet of Mamuret el Aziz, Asiatic Turkey, situated at an altitude of 2900 feet, about 10 miles southwest of the Euphrates and about 90 miles northwest of Diarbekir (Map: Turkey in Asia, D 2). It is a well-built town, with a fine khan and extensive bazars. Fruit culture constitutes the chief industry, and the town is of considerable commercial importance. There are a number of European and American missionary stations. Pop., about 30,000, including over 3000 Armenians. During 1895 it was the scene of fearful atrocities, when about 3000 Armenian Christians were massacred. The ancient town of Malatia or Melitene, 5 miles to the northeast, at Eski-Shehr, now a mass of ruins, was the station of the twelfth legion in the time of Titus and was raised to the rank of a city by Trajan. It was in turn the capital of Armenia Secunda and Armenia Tertia.

MÂLAVIKÂGNIMITRA, mä′lȧ-vė-käg′nė-mė-trȧ. A Sanskrit drama of love and intrigue ascribed to Kalidasa. The leading characters are Agnimitra, King of Vidīsha, and Malavika, an attendant of the Queen. The action is supposed to have taken place during the second century B.C. In poetical quality the work is much inferior to the Sakuntala. It has been translated into German by Albrecht Weber (1856), into French by Foucaux (1877), and into English by Tawney (1875).

MALAYALIM, mä′lȧ-yä′lĭm. Inhabitants of the Malabar coast of southwestern India, sometimes called Malabars. They form one of the civilized peoples of Dravidian stock. They have a written language, the alphabet being derived from Hindu sources. The Malayalam language is thought to have been originally an offshoot of Tamil, but ranks now as an independent tongue, with a literature of its own. Both language and literature, as is the case with all the civilized Dravidian peoples, are being and have been considerably influenced by the modern and old Aryan dialects about them. The Malayalim, who number 6,000,000 or 7,000,000, have been converted to Hinduism, and a few to Christianity. The first great work in Malayalam is the epic *Ramacharita*, dating from the fourteenth century. A collection of 1000 Malayalam proverbs was published at Mangalore in 1868. Consult: R. Caldwell, *Grammar of the Dravidian or South-Indian Family of Languages* (2d ed., London, 1875); R. N. Cust, *Modern Languages of the East Indies* (ib., 1878); L. J. Frohnmeyer, *Progressive Grammar of the Malayalim Language for Europeans* (Mangalore, 1889); T. K. Krishna Menon, "Notes on Malayalam Literature," in *Royal Asiatic Society Journal* (London, 1900). See DRAVIDIANS.

MALAY'AN PEOPLES. An ethnic term, diversely employed by various authorities. Some, who reject the claims of the Malayan or brown race to rank as a separate division of mankind, on the ground that its Asian or Mongolian affinities are both too recent and too apparent, recognize a "Malayic stock," composed of a western or Malayan and an eastern or Polynesian group. (See MALAYO-POLYNESIAN.) By this theory the ancient Malays, presumed to be yellowish brown in complexion, small-statured and short-skulled, are connected with the Indo-Chinese peoples of continental Asia. Others, who also decline to see in the Malayan race one of the primal human stocks, consider the Malay type distinctly Mongoloid. An "Oceanic Mongol group" is postulated which includes all the peoples of Malaysia and the islands of the Pacific who are not Negritos, Papuans, or Indonesians (qq.v.). The population of Malaysia may be divided into four great ethnic groups, Malays, Indonesians, Negritos, and Papuans, while the archipelagoes of the Indian Ocean and the Pacific were peopled by three distinct races, at least one of which has left a linguistic impress upon the Malayans. The Indonesians and Malays do not differ greatly from each other and the former have been regarded by some as proto-Malays. Certain writers, in view of the fact that dolichocephalic head forms occur quite commonly among the existing peoples of the East Indies, restrict the term Indonesian to the dolichocephalic variety of man found in this region. They would apply the term Malay or proto-Malay only to the brachycephalic non-Negrito, non-Papuan, and non-Melanesian variety. According to this theory, before the dispersion over this area of the Orang Malayu, or Malays proper, most of the islands of the Malay Archipelago were inhabited by tribes representing various degrees of intermixture of these two races, while, neglecting migrations from the Asiatic continent, the last 1000 years have witnessed nothing more than similar mixtures in varying degrees. The reasons for separating the so-called Indonesians from the Malayan stock are not, however, convincing. The suggestion of the linguistic unity of the Malayo-Polynesian peoples and recognizing a somatic kinship of all the aborigines of Malaysia, together with the Malays of the Malay Peninsula and the Malays of Madagascar and the natives of Oceanica, except the Negritos, Papuan-Melanesians, and kindred peoples, is now known to rest upon wholly insufficient evidence and has been given up. Besides their use in this broad sense the terms Malay and Malayan are also probably a considerable Malayan or proto-"Malays proper" of the Malay Peninsula, the Menangkabau region of Sumatra, and certain other parts of some of the larger islands, and their representatives scattered in small numbers practically all over the archipelago. There is also probably a considerable Malayan or proto-Malayan element in certain regions of the coast of Farther India, the Chinese littoral, and southern Japan. There may also be a large Malayan element in Japan and even in Korea, due to immigration in the wake of the Kuro-Siwo current from the East Indies, by way of the Philippines, Formosa, and Luchu. Some writers go so far as to attribute the difference between the Chinese and the Japanese largely to the fact of this Malay cross in the latter.

The Malayan peoples present all varieties of savagery, barbarism, and civilization, from the rude tribes of the interior of some of the islands to the more or less cultivated Malays of the coast, the Javanese, and the civilized peoples of the Philippines. The migration which led to the settlement of the Malays in Madagascar, called Malagasy or Hovas, took place apparently before the spread of Hindu influence in the East Indies, to which was in great measure due the religious and political stimulus that created so many kingdoms in Sumatra, Java, with the adjacent smaller islands, and Borneo, and touched even the Philippine Islands on one hand and New Guinea on the other. There have evidently been several waves of proto-Malay and Malay influence in this area. One of the most notable is that which bore the creed of Islam as far as the Moros of the southern Philippine Islands, and raised it upon the ruins of both the Hindu and the Buddhistic faiths in Sumatra and Java. The influence of India in Sumatra seems to have been less than in Java, where exist the remains of the great temple of Boro Buddor (q.v.) and other evidences of Indo-Malay culture. In the little island of Bali a form of Hinduism survives to this day. In parts of Sumatra, Borneo, and Formosa very primitive types of Malayan life and culture are still to be found.

All over the Malayan area the languages of this family show a more or less close kinship with the standard Malay of Menangkabau, which is in many respects the least complicated dialect of the group. The relations of some of the Formosan and Bornean dialects to the Malayan stock are not yet very clear. The Malayo-Polynesian speech family was erected by Bopp on a certain community of vocables which he observed between Malayan and Polynesian languages. Recent examination of richer material than was available for Bopp has shown (Churchill, *The Polynesian Wanderings*, *The Subanu*, etc.) that the sum of this community barely exceeds 250 words, a trivial amount in any vocabulary. This community is now explained as Polynesian loan material which came into the possession of the Malayans during the somewhat protracted period when they were driving the Polynesians out of Indonesia in their own later migration. This linguistic interpretation of events is supported by the fact that between the Malayans and the Polynesians the somatic and cultural differences are irreconcilable with any theory of community of origin. None of the Polynesians proper (except the civilized peoples) possess written alphabets, but among the Malayan peoples a variety of them occur. The Malays proper, like the Philippine Moros, use Arabo-Persian alphabets that came with Islam. Among the civilized peoples of the Philippines, as the Tagals and Visayans, the alphabets in use since the thirteenth century seem to be of Indian origin, and the same statement holds regarding those of certain peoples of Celebes. The Javanese and several of the Sumatran peoples have alphabets of Hindu or Arabic origin. The literary culture of the Malayan peoples is in some sections quite advanced, particularly in Java, where the sacred books are preserved in the Kavi (q.v.) or ancient Javanese language. In Java, too, the puppet show and the primitive drama are at home. The Macassars of Celebes have also developed their literary instinct to a considerable extent. The literature of the civilized tribes of the Philippines is quite large, several thousand books and pamphlets having been printed in the native dialects. The Low Malay of Sumatra has become a sort of *lingua franca* for the whole Malay Archipelago, and has a literature of its own.

Among the Malayans agriculture varies from the rudest tillage of the savage tribes to the highly developed system of the Battas. It is characteristic of the uneven temperament of the Malayan stock that anthropophagy in a curious form (the eating of criminals) lingered so long among a people otherwise so far above the average as the Battas. Head hunting, once common among the wilder tribes in large regions of the archipelago, is dying out, even in Borneo and Formosa. Widespread among Malayan peoples is the custom of betel chewing, the use of the *sumpitan*, or blowgun, and of the *kris*, or dagger. Pile dwellings (see LAKE DWELLINGS) often occur even on dry land. Of interest to the sociologist are the customs of teknonymy, clan-exogamy, patriarchy, and the coexistence of family and individual property. The utilization of iron by the Malayan peoples is one of the marked features of their native culture. Loom weaving forms an important industry, and there has been a development of peculiar dyeing techniques. The extensive use of bamboo and rattan strongly colors Malay culture, particularly in the structural employment of lashings rather than nails for fastening.

The Malayan peoples have shown considerable genius in the direction of art and literature and have produced a number of great men. Some of the native rajahs and sultans of Sumatra and Java have been men of much ability. The Malayans, moreover, are not a decadent or a disappearing race, as the large increases in the population of Java and the Philippines show. Their character has generally been rated rather low by Occidental observers, but the deceit, untrustworthiness, unevenness, treachery, and other bad qualities attributed to them have been much exaggerated and the depth of feeling, honor, and moral and intellectual possibilities correspondingly underestimated.

As to the origin of the Malays, some authorities suppose them to have come from the southeastern part of Asia through the Malay Peninsula, whence they spread over the Indo-Pacific world. According to this theory their first occupation of Sumatra and Java dates from between 1000 and 2000 years before the Christian era, and the expansion of the Malays could not have been much later than the Aryan conquest of India. Others consider the Malays proper to be of comparatively recent origin, and assign their entrance from Malacca upon Indonesia to a period little anterior to the Christian era. The best view is that the Malayan stock is of continental origin and of Mongoloid affinities, developed in certain directions in its insular habitat. The Malayan stock is of very great value to the ethnologist by reason of the numerous and manifold cultures that have influenced it, as Hindu, Chinese, Arab, Portuguese, Dutch, Spanish, English, American, Japanese, from which have resulted important social, religious, political, and linguistic complications. In the northern part of the archipelago intermixture with a primitive Negrito element, Aëtas (see AËTA) of Luzon, has occurred to some extent, while in the east Papuan-Melanesian elements are discernible, and in the central area it is still possible to trace contact zones with such folk as the Toradja of Celebes, the Dusun of Borneo, and the Arafura of Ceram, all of which are considered to be survivals of a race of possibly pygmoid autochthons anterior even to the Polynesian occupation of the islands. Spanish relations with Mexico have caused even some American Indian blood to mingle with that of the natives of part of Mindanao.

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MALAYAN SUBREGION. In zoögeography, a faunal district of the Oriental region (q.v.), comprising the Malay Peninsula south of Tenasserim, Sumatra, Java, Borneo, and all the archipelago west and north of Lombok and Celebes, as far as and including the Philippines. It intercalates with the Indian and Chinese subregions along the eastern coast of the Bay of Bengal, and is known in some books as Indo-Malayan. Its southeastern boundary (Wallace's line), at the Strait of Macassar, is curiously distinct from that of the Australian region, although the two are separated only by narrow waters. An explanation of this will be found in the article DISTRIBUTION OF ANIMALS, illustrated by maps. This is almost entirely a region of tropical and forested islands, and its animals are those most typical of the Oriental fauna—i.e., organisms suited to uniform but not extreme heat, plenty of moisture, and approximately uniform meteorological conditions throughout the year. One result of this is an interesting similarity between its faunal characteristics and those of equatorial Africa on the one side and of the Amazonian region on the other. The tapirs and trogons of South America and the African anthropoid apes and hornbills are curiously paralleled by similar Malayan species absent elsewhere. A noteworthy resemblance also exists between the Malayan and Malagasy regions. Two very conspicuous groups characteristic of this subregion are the birds of paradise and the orang-utan—the last recalling the fact that Java was the home of *Pithecanthropus* (q.v.), which, with other considerations, has led many ethnologists to believe that mankind developed its species in this part of the world. See ORIENTAL REGION.

MALAY, mȧ-lā′ *or* mā′lā (INDIAN, or EASTERN), **ARCHIPELAGO.** The largest system of island groups in the world, situated between southeast Asia and the Australian continent, separating the Pacific from the Indian Ocean, and extending 20 degrees north of the equator and about half that distance south of it. Exclusive of New Guinea, the archipelago has a total area of about 745,000 square miles, with an estimated population (1905) of 50,000,000. The principal groups are the Sunda Islands, including Sumatra, Java, Bali, Lombok, Sumbawa, Flores, Timor, and the neighboring islands; Borneo and Celebes, with their dependent isles, to the north of the Sundas; the Philippines, northeast of Borneo, and the Moluccas, east of Celebes. The western, or Dutch, division of New Guinea is also reckoned a part of the Malay Archipelago. The islands are all mountainous, the loftiest peak being Kinabalu in Borneo, 13,698 feet. The archipelago is remarkable for the number of volcanoes, active and extinct. Nearly all of these islands are abundantly watered and covered with luxuriant tropical vegetation. The Portuguese were the first Europeans to engage in trade in the archipelago, but the chief European nations to exploit the islands have been the Dutch and the Spanish, and the archipelago now practically belongs to the former, with the exception of the Philippines (which belong to the United States), the northern part of Borneo (which is British), the British island of Singapore, and a part of the island of Timor (which is Portuguese). The name Indonesia is sometimes applied to the Malay Archipelago.

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MALAY′O-POL′YNE′SIAN. A speech family erected by Franz Bopp in 1841 to account for a certain community of vocabulary which he had observed to exist between Malayan and Polynesian languages. This community has now been shown to consist of no more than the mere trifle of some 250 words best explicable as loan material which the Malayans have accumulated from the Polynesians, whom they dislodged. It has been established that the Polynesian languages are of the isolating type and the Malayan languages are agglutinating, therefore they cannot form a single family. The term has now no more than historic interest

MA′LAY (mȧ-lā′ *or* mā′lā) **PENINSULA,** or **MALAC′CA.** A long, narrow peninsula projecting in a southeasterly direction from the southeastern part of Asia, beginning about lat. 13° 30′ N. and terminating in lat. 1° 22′ N. It is bounded by the China Sea on the east and the Indian Ocean on the west, and is separated from Sumatra by the Strait of Malacca (Map: French Indo-China, D 6). It is about 850 miles long and its width varies from 45 miles at the Isthmus of Kra to upward of 200 miles at Perak. The peninsula is formed by the southern extension of the mountain ranges that are the water parting between the basins of the Salwin and Menam rivers. The highest known peak is Gunong Korbu, 7217 feet. The granite and sandstone mountain backbone is not continuous, but is broken into several fragments; and the plains, east and west of the mountains, are cut up into areas, large or small, by broad river valleys, in which comparatively small streams carry the drainage to the sea, some of them being navigable for short distances.

The climate is extremely humid, which makes it disagreeable for foreigners, and the undrained swamps and uncleared jungles offer breeding places for disease-bearing insects. The health conditions of the towns important in commerce have been much improved by sanitary measures. The port of Malacca, e.g., once regarded as the grave of Europeans, is now fairly salubrious. The vegetation is rich and varied, and the forests which still cover nearly the entire peninsula are full of palms, as many as 42 varieties being known to exist. The fauna of the peninsula is not unlike that of Borneo and Sumatra, but it has in addition some species unknown in those islands, as the royal tiger, the elephant, deer, and rhinoceros, of which there are two kinds. The peninsula is very rich in minerals, especially tin, which is mined to a very large extent, the greater part of the world's tin coming from this region. Silver and gold are also found, the export of the latter from the Federated Malay States for 1912 amounting to 14,421 ounces.

The principal agricultural products are raw sugar, cotton, tobacco, coffee, and tea.

Politically the peninsula is divided between Siam and Great Britain. To the former belong the provinces of Quedah, Patani, Kelantan, Trenganu, and some others, occupying the northeastern and middle portions of the peninsula. The southern half of the rich Province of Tenasserim, Burma, forms the northwestern part of the peninsula. The Straits Settlements, consisting of Singapore, Malacca and Penang, with the provinces of Wellesley and the Dingdings, constitute a crown colony of Great Britain, while the Federated Malay States of Perak, Selangor, Negri Sembilan, with its amalgamated states, and Pahang, together with the native state of Johore, are under the protection of Great Britain. The total area of the peninsula is estimated at about 90,000 square miles, with a population of about 2,000,000, consisting for the greater part of Malays and Siamese, with a small number of Negritos, Chinese, and Europeans. The commerce of the peninsula is greatly promoted by the fact that the Strait of Malacca is the gateway between the Far East and the Occident. The vessels of over 50 regular steamship lines are constantly passing through it, stopping at Singapore. For details, see articles on STRAITS SETTLEMENTS; SINGAPORE; PAHANG; PERAK; BURMA; ETC.

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MALAYS. The term applied to a particular group or section of the Malayo-Polynesian race, found in its approximate purity in the peninsula bearing this name and the Menangkabau region of Sumatra. Soon after their arrival the Malays proper intermingled to a certain extent with their predecessors. Into the peninsula they brought a relatively high culture. The Malays of the interior are in all respects more fixed in type than those of the coast. With the exception of the degenerate population of the seaports, the Malay gives abundant evidence that he has behind him a somewhat high culture, with which are associated a varied artistic skill and the expressions of a well-developed language and literature. The better part of the Malays, represented by the forest dwellers, as contrasted with the inhabitants of the towns, are not only men well up in their special crafts, but very companionable, and fond of their homes and families. Their loyalty to their native chiefs, their honesty, and their sense of personal honor are marked. See MALAYAN PEOPLES.

MALAY STATES, FEDERATED. See FEDERATED MALAY STATES.

MALBAIE, mȧl'bā'. See MURRAY BAY.

MALBONE, măl-bōn', EDWARD GREENE (1777–1807). An American miniature painter, born at Newport, R. I. In 1800 he accompanied Washington Allston to Charleston, S. C., and the next year went to Europe. At London he met Benjamin West, president of the Royal Society, who recognized his ability and even urged him to make London his permanent residence. Malbone, however, returned to Charleston, and subsequently practiced his art with success in several American cities, devoting himself particularly to miniatures. For sound draftsmanship, grace of execution, and beauty of expression his miniatures bear comparison with those of the great English masters. They are valued possessions of many American private families, and also of the Pennsylvania Academy and of the Boston Museum of Fine Arts, which owns a portrait of Washington Allston. His best canvas is "The Hours," in which the present, past, and future are represented by female figures. This work, which was bought from the Malbone heirs for $1200, is now in the Providence Athenæum.

MALBROOK, mȧl-bru̥k', or **MALBROUGH.** A French satirical song, written about the Duke of Marlborough. It is known also by the words of its first line. The first stanza runs as follows:

> Malbrough s'en va-t-en guerre,
> Mironton, mironton, mirontaine;
> Malbrough s'en va-t-en guerre;
> Ne sait quand reviendra, etc.

The author of the song is unknown, but it was probably written after the battle of Malplaquet (Sept. 11, 1709). It was sung by Marie Antoinette, and it spread from Versailles throughout France. The form of the stanza is similar to that of a lament on the Duke of Guise (1566); but the music cannot be traced back beyond the time of Louis XIV. Beaumarchais incorporated the song in his *Mariage de Figaro* (1784); and Beethoven made use of the melody in his *Battle Symphony.* The tune is well known among English-speaking peoples as that to which the words of "We won't go home till morning" are sung.

MALBROUK (Fr. *malbrouk, malbrouch,* sort of monkey, probably a corruption of Eng. *Marlborough*). A West African monkey (*Cercopithecus cynosurus,* or *Lasiopyga cynosura*), one of the guenons. It has yellowish grizzled fur and a broad flesh-colored face, with a band across the forehead, the stiff side whiskers, throat, and under parts white. Little is known of its habits.

MALCHAM, măl'kăm. See MOLECH.

MALCOLM, măl'kom. The name of four kings of Scotland.—MALCOLM MACDONALD succeeded to the throne on the abdication of Constantine II in 943. The most important event of his reign was the cession of Cumbria about 945 by the English monarch Edmund I. Malcolm was slain about 954 while engaged in quelling a revolt in the north of Scotland.—MALCOLM MACKENNETH was a grandson of the preceding. He ascended the throne in 1005. His life was passed chiefly in repelling the incursions of the Danes. He died in 1034. A collection of laws, the *Leges Malcolmi MacKenneth,* has been attributed to him, but is obviously a work of a later age.—MALCOLM MACDUNCAN, surnamed

Canmore, ascended the throne on the death of Macbeth (q.v.) in 1054, being the son of Duncan, whom Macbeth slew. After William of Normandy had seated himself on the English throne many noble Saxons sought refuge at the Scottish court, among them being Edgar Atheling, nearest of kin to the Confessor, with his mother, Agatha, and his sisters, Margaret and Christina. Margaret, who was young, beautiful, and pious, captivated the heart of the Scottish King, and a marriage quickly followed. Malcolm's new relations, however, unfortunately, embroiled him with the Normans. In 1070 he crossed the border, harried Northumberland and Yorkshire, but was soon obliged to retreat. William the Conqueror retaliated in 1072 and wasted Scotland as far as the Tay. At Abernethy, Malcolm was compelled to acknowledge him as his liege lord, but (as the Scottish historians hold) only for such parts of his dominions as had belonged to England, viz., Cumbria and the Lothians. War was waged between England and Scotland from 1077 to 1080 and broke out again in 1091, probably at the instigation of the fugitive Anglo-Saxons and the discontented Normans, who had been pouring into Scotland during the iron reign of William and had obtained large grants of land from the Scottish monarch. Nothing of note, however, happened, and peace was again concluded; but not long after there was a fresh rupture, and in 1093 Malcolm again crossed the border and laid siege to Alnwick; but while so engaged he was suddenly attacked, defeated, and slain, on Nov. 13, 1093.—MALCOLM, surnamed The Maiden (1141–65), was a grandson of David I, and succeeded that monarch in 1153, when only in his twelfth year. He had no sooner mounted the throne than a Celtic insurrection, headed by Somerled, Lord of the Isles, broke out. Some years after another insurrection broke out among "the wild Scots of Galloway," under their chief, Fergus, to crush which Malcolm had to employ a large force. In 1164 he was obliged to put down a second rebellion, led by Somerled. He died at Jedburgh, of a lingering disease, Dec. 9, 1165.

Bibliography. Robertson, *Scotland under her Early Kings* (Edinburgh, 1862); E. A. Freeman, *Norman Conquest* (5 vols., Oxford, 1867–79); id., *Reign of William Rufus* (2 vols., Oxford, 1882); Skene, *Celtic Scotland* (3 vols., Edinburgh, 1876–80); Andrew Lang, *History of Scotland*, vol. i (New York, 1900); A. C. Lawrie, *Annals of the Reigns of Malcolm and William, Kings of Scotland* (ib., 1911).

MALCOLM, SIR GEORGE (1818–97). A British general, born at Bombay, India. He entered the army at 18, and three years later was taking part in the Afghan War as deputy assistant to the commissary general. He was promoted to be a lieutenant in 1840, captain in 1849, and lieutenant colonel in 1854, having served in Baluchistan and throughout the second Sikh War. His next campaign was in Persia (1856–57). He was made colonel (1860) and major general (1867) for his gallant services during the Indian Mutiny, and after the Abyssinian War of 1868 was knighted, made lieutenant general (1875), general (1877), and publicly thanked by Parliament. He retired in 1881. His *Remarks on the Indian Army* (1868), published privately, gained importance from the fact of his having commanded Sind cavalry and Bombay native infantry.

MALCOLM, SIR JOHN (1769–1833). A British colonial administrator and author. He was born at Burnfoot, Dumfriesshire, Scotland, May 2, 1769, and at the age of 14 went to India as a cadet in the Madras army. He distinguished himself at the siege of Seringapatam in 1792 and was appointed to the staff as Persian interpreter. In 1800 he was sent as Envoy to Persia, to form an alliance with that country against Bonaparte, in which he succeeded. In 1808 and 1810 he was sent as Minister Plenipotentiary to the Persian court. In 1803 he had been appointed Governor of Mysore; and during the two following years his administrative talents were of important service to the government in deducing to order and tranquillity the newly conquered Mahratta states. In 1812 he returned to England, received the honor of knighthood, and after five years returned to India as the Governor-General's political agent in the Deccan, with the rank of brigadier general in the Indian army; in the latter capacity he distinguished himself in the wars against the Pindarris and Holkar. He was in England again from 1821 to 1827, when he was appointed Governor of Bombay. He finally left India in 1830 and died of paralysis at Windsor, May 30, 1833. Malcolm's writings are: *Sketch of the Sikhs* (1812); *A History of Persia* (London, 1815; 2d ed., 1828); *Memoir of Central India* (ib., 1823); *Political History of India from 1784 to 1823* (ib., 1826); *Life of Lord Clive* (ib., 1836), a posthumous work. Consult J. W. Kaye, *The Life and Correspondence of Major-General Sir John Malcolm* (2 vols., ib., 1856).

MALCZEWSKI, mȧl′chĕv′skė, or **MALCZESKI,** ANTONI (1792–1826). A Polish poet, who was born and died at Warsaw. In 1811 he entered the Polish army and led a gay life in Warsaw, but resigned in 1816, after being seriously wounded in a duel. He went abroad, and in Venice became intimate with Byron, whose *Mazeppa* was directly inspired by Malczewski's vivid account of the story. He returned to Warsaw, then settled in Volhynia, where he wrote *Marja* (1825). The plot is simple. Vaclav, a nobleman, is united to Marja against his father's will. The latter feigns reconciliation and sends out his son to fight the Tatars. In his son's absence he causes Marja to be drowned and Vaclav finds her corpse on his return. Malczewski fell in love with the wife of a friend and had to leave for Warsaw, whither she soon followed him, and where they lived in misery. The pictures of the steppes, the portrayals of passion, the characterization of the chief personages of *Marja* are gems. The poem appeared in a German translation by Nitschmann in his *Polnischer Parnass* (4th ed., Leipzig, 1875).

MAL DE MER, mȧl de mâr′. See SEASICKNESS.

MALDEN, mạl′den. A city, including several villages, in Middlesex Co., Mass., 5 miles north of Boston, on the Malden River and on the Boston and Maine Railroad (Map: Massachusetts, E 3). It has a public library, a city hospital, a Home for Aged Persons, and a Young Men's Christian Association building. There are extensive rubber interests and manufactories of boots and shoes, cotton goods, fibre goods, wire cord, sweaters and jerseys, leather, and boot and shoe lasts. The city also enjoys some reputation as a residential place. Malden's total expenditures in 1912–13 were $2,120,000, the principal items of expense being $245,000 for schools, $32,000 for the water works, $33,000 for charitable institutions, $57,000 for the fire department, $51,000 for the police department, and $61,000 for sanitation. The city's income was $2,170,000. The water works, which supply Malden and the cities of Medford and Melrose, were built in 1869 at a cost of over $1,000,000. These works are now a part of the Metropolitan District water system. Pop., 1890, 23,031; 1900, 33,664; 1910, 44,404; 1914 (U. S. est.), 48,979; 1920, 49,103.

Malden formed part of Charlestown until 1649, when it was incorporated as a separate town. Michael Wigglesworth (q.v.) was an early pastor here, where in 1662 he wrote *The Day of Doom.* In 1881 the town was incorporated as a city. Consult Corey, *The History of Malden, Massachusetts* (Malden, 1899).

MALDIVE (măl′dīv) **ISLANDS.** A chain of low coral islands in the Indian Ocean, about 300 miles southwest of Cape Comorin (Map: Asia, J 8). It consists of 17 compound atolls, each of which has a number of smaller atolls arranged around a central lagoon, so that the entire number of islets amounts to many hundred, the aggregate area being, however, only about 200 square miles. The elevation above the sea level is in no case more than 20 feet, and generally only 6 feet. The larger and inhabited islands, of which there are about 200, are covered with coconut palms and fig, citron, and breadfruit trees; wild fowl and fish are abundant. The climate is very hot and, owing to the numerous lagoons and swamps, unhealthful. The inhabitants, who number about 50,000, are Singhalese of the Mohammedan faith and are good sailors, carrying on an active trade with the Malabar coast, to which they export in their own vessels coconuts, copra, tortoise shells, and dried bonito fish. They are governed by a sultan residing at Mali, the largest of the atolls, but are under British protection and subject to the Governor of Ceylon. They were formerly under the Portuguese and the Dutch flag. Consult J. S. Gardiner (ed.), *Fauna and Geography of Maldive and Laccadive Archipelagoes; being the Account of the Work and Collections Made during 1899 and 1900* (10 vols., Cambridge, 1901–06); Alexander Agassiz, "The Coral Reefs of the Maldives," in *Harvard University, Museum of Comparative Zoölogy, Memoirs,* vol. xxix (Cambridge, Mass., 1903).

MALDIVE LANGUAGE. The Indian dialect spoken in the Maldive Islands. It is closely related to the Ceylonese (see CEYLON, *Language and Literature*) and represents a younger stage of it. The phonological tendencies already seen in Ceylonese have been carried further in Maldive, and it seems that the latter dialect has been influenced by some non-Indian language, yet its Ceylonese origin is clear. The Maldive alphabet was formerly written from left to right, like the Ceylonese script, on which it seems to have been based. Later the direction was reversed, and to the 24 original letters three from the Perso-Arabic alphabet were added. No literature exists as yet, and before the researches of Wilhelm Geiger, who visited the islands for linguistic investigations in 1895–96, the only written specimens of Maldive were the vocabularies of Pyrard (1602–07) and Christopher (1834), as well as a small manuscript dictionary at Copenhagen and a glossed Persian-Hindustani dictionary in the India Office in London. In 1902 Geiger issued an *Etymological Vocabulary of the Mâldivian Language* (London). Consult also the same author's *Maldivische Studien* (Munich, 1900–02).

MALDON, mạl′don. A market town and river port in Essex, England, a mile below the confluence of the Chelmer and the Blackwater, 9 miles east of Chelmsford (Map: England, G 5). It has manufactures of crystallized salt, also brickmaking, iron founding, oyster fisheries, and some shipping trade. It has a quaint town or moot hall built in the reign of Henry VI and a grammar school founded in 1547. At Osea Island, off the town, is a farm colony for the London unemployed. It has Roman, Saxon, and Danish remains and is mentioned in 913 as an encampment of Edward the Elder. It received its first charter from Henry II and was incorporated in 1553. Pop., 1901, 5600; 1911, 6253. Near Maldon is Purleigh, where Lawrence Washington, great-grandfather of George Washington, was rector from 1632 till expelled by the Puritans in 1642. The fine tower of this church has been restored by Americans as a Washington memorial.

MAL′DONA′TUS, or **MALDONADO,** JOHANNES (1533–83). A Jesuit theologian. He was born at Casas de Reina, Estremadura, Spain, and was educated at Salamanca. There he became professor of theology (1556); in 1562 he became a Jesuit at Rome and in 1563 was sent to Paris to found a college. He taught with such success that jealousy caused charges of heresy against him by the Sorbonne. He was cleared of heresy in 1575, but withdrew to Bourges and ultimately (1580) to Rome, where he died, Jan. 5, 1583. He is reckoned one of the greatest Roman Catholic exegetes. A list of his books is in Backer, *Bibliothèque des écrivains de la compagnie de Jésus* (Paris, 1890–1900). Most famous of them is his commentary on the Gospels, of which the best edition is by Raich (Mainz. 1874); English translation by Davis (2d ed., London, 1888). Consult the preface to Raich's edition; also Prat, *Maldonat et l'Université de Paris au XVIe siècle* (Paris, 1856).

MALEBRANCHE, mȧl′bräNsh′, NICOLAS (1638–1715). A French philosopher. He was born in Paris, where his father was president of the Chambre des Comptes. He was deformed and sickly, with a constitutional inclination to solitude. His early education was conducted at home. After studying theology at the Sorbonne, he entered the Congregation of the Oratory at the age of 22. He devoted himself without much success to critical and historical studies, until Descartes' *Traité de l'homme* fell into his hands and opened up to him his life work. He spent 10 years in the study of the Cartesian system of philosophy and published the results in his famous *Recherche de la vérité* (1674; Eng. trans., by T. Taylor, London, 1694). This work, admirably written, had for its object the investigation of the causes of the errors to which the human mind is liable, as well as of the nature of truth and the way of reaching it. To condense its theory: God, by reason of His omnipotence, is able to give an external existence to His thoughts; in this consists creation. The material world is an inexplicable duplication of God's ideas and is by God known through His ideas. We human beings know this material world by seeing His ideas of it. Unless we saw God "we could see nothing else," and in seeing God we see His ideas, which are the prototype of the material world. God is the cause of all changes taking place in bodies and in souls, the latter being therefore merely passive in the former. All apparent causation of object by object in the perceived world is only occasional causation. (See OCCASIONALISM.) All physical and psychical changes follow an apparent causal order only because God uses the occurrence of a so-called cause as the occasion on which He calls into being a so-called effect. Only God can cause events to happen; it is an incommunicable divine attribute.

Malebranche's system is a kind of mystic idealism, in some important respects anticipating Berkeley's (q.v.) idealism, but approximating pantheism much more than Berkeley's theory. It was subjected to a thorough examination by Locke and Leibnitz and opposed by Bossuet and especially by Antoine Arnauld, the Jansenist leader. The attacks made upon it led Malebranche to discuss the relations between philosophy and theology in *Conversations métaphysiques et chrétiennes* (1677; Eng. trans., London, 1698), which was followed by a *Traité de la nature et de la grâce* (1680; Eng. trans., London, 1695) and by *Méditations chrétiennes et métaphysiques* (1683), while he dealt with his chief antagonist expressly in a series of *Réponses de Malebranche à Arnauld.* Still further volumes written in similar spirit were *Traité de morale* (1684; Eng. trans., 1699), *Entretiens sur le métaphysique et sur la religion* (1688), *Traité de l'amour de Dieu* (1697), *Entretiens d'un philosophe chrétien et d'un philosophe chinois sur l'existence et la nature de Dieu* (1708), and *Réflexions sur la prémotion physique* (1715). Malebranche died in Paris. There his collected works were published in 1712 and again in 1837 and 1859–71. Consult, for his life, André, *Vie du R. P. Malebranche* (Paris, 1886); and for his philosophy: Blampignon, *Etude sur Malebranche d'après des documents manuscrits* (ib., 1862); Ollé-Laprune, *La philosophie de Malebranche* (ib., 1870–72); Grimm, "Malebranches Erkenntnistheorie und deren Verhältnis zur Erkenntnistheorie des Descartes," in *Zeitschrift für Philosophie und philosophische Kritik* (Berlin, 1877); Joly, *Malebranche* (Paris, 1901); G. N. Dolson, "The Idealism of Malebranche," in the *Philosophical Review*, vol. xv (New York, 1906); Lewin, *Der Lehren von den Ideen bei Malebranche* (Halle, 1912).

MAL′ECITE. An Algonquian tribe, closely related to the Abnaki and scattered over western New Brunswick, chiefly along the St. John River, to the number of about 850. The name, frequently written Malisit, has been variously rendered "disfigured foot" and "broken talkers." Together with the more eastern bands of the Abnaki, they were sometimes known as Etchemin. In the Colonial wars they took the French side.

MALECKI, mȧ-lĕt′skė̂, ANTONI (1821–1913). A Polish poet, philologist, historian, and scientist. He was born near Posen, studied philology and history at Berlin, and afterward was instructor in classical philology at Cracow and Innsbruck. From 1856 until 1873 he was professor of Polish language and literature at the University of Lemberg. He became a member of the Austrian House of Peers in 1881. Through his scientific writings he was widely known in Poland, particularly after the publication of his two Polish grammars, *Gramatyka języka polskiego większa* (1863) and *Gramatyka historyczno-porownawcza języka polskiego* (2 vols., 1879)—the best Polish grammar. His ability as a literary critic and biographer is shown in his study of the poet Slowacki, *Juliusz Slowacki, jego życie i dziela* (3 vols., 1866–67). He wrote also *List żelazny* (1854; in German, 1858), an historical drama; *Grochowy wieniec* (1855), a comedy; *Jadwirga* (1860), a tragedy. Among other things showing his philological scholarship and classical interests are his *Encyklopedya filologii Klasycznej* (1851) and the translations of Sophocles' *Elektra* and *Antigone* (1854). He was a member of several learned societies, took an active part in the political life of Galicia, and was to the end of his life curator of the Ossolinsk National Institute at Lemberg.

MALE FERN (*Aspidium filix-mas*). See LADY FERN.

MALEIC (mȧ-lē′ĭk) **ACID.** See FUMARIC AND MALEIC ACIDS.

MALEO, măl′ė̂-ō, **MAL′LEE BIRD.** The mound bird (q.v.) of Celebes.

MALESHERBES, mȧl′zârb′, CHRÉTIEN GUILLAUME DE LAMOIGNON DE (1721–94). A distinguished French statesman, born at Paris and educated at the Jesuit College of Paris. He became counselor to the Parlement of Paris in 1745 and succeeded his father as president of the Court of Aids in 1750. In this office and as censor of the press he was an outspoken champion of the liberties of the people against the monarchy. By him in great measure the publication of the famous *Encyclopédie* was made possible. In 1771 his bold remonstrances against the abuses of law which Louis XV was perpetrating led to his banishment to one of his estates. Louis XVI, who esteemed him, recalled Malesherbes in 1774. In 1775 he was appointed Minister of the Interior, his friend Turgot being at this time Minister of Finance; but in 1776 he resigned, his attempts at internal reform having proven unsuccessful against the intrigues of privileged interests. From this period to the Revolution he passed his time in travel or in the improvement of his estates, with the exception of one year (1787–88) when he was a Minister of State. Malesherbes took no part in the early movements of the Revolution, but in 1792 came forward and obtained permission from the Convention to conduct the defense of Louis XVI. He helped his old master little and caused his own ruin. Arrested in December, 1793, he was found guilty of treason and executed with several members of his family in April, 1794. Malesherbes was a member of the French Academy, a writer of great ability on political, legal, and financial questions, and one of the most virtuous and high-minded statesmen of the eighteenth century.

Bibliography. Various writings of Malesherbes have been published in *Œuvres choisies de Malesherbes* (Paris, 1809); Gaillard, *Eloge historique* (ib., 1805); Dubois, *Notice historique* (ib., 1806); J. B. C. Isoard (called Delisle de Sales), *Life of Lamoignon Malesherbes*, translated by Edward Mangin (2d ed., Bath, England, 1814); F. A. de Boissy d'Anglais, *Essai sur la vie, les écrits, les opinions de M. de Malesherbes* (Paris, 1818); Marquis de Beaucourt, *Captivité et dernières heures de Louis XVI* (ib., 1892); Vieux, *Les Lamoignons, une vieille famille de robe* (ib., 1896).

MALET, mȧ′lā′, CLAUDE FRANÇOIS DE (1754–1812). A conspirator against Napoleon I. He was born at Dôle, in the Department of Jura, and in 1770 joined the King's musketeers. On the outbreak of the Revolution he joined the National Guard and fought in 1792 on the Rhine. Subsequently he saw service in Italy, attaining the rank of brigadier general in 1799. From the establishment of the Consulate he came to regard Napoleon's motives with suspicion and by his open advocacy of republican institutions aroused the ill will of Napoleon. In 1808 he was charged with conspiracy and thrown into prison, where, in conjunction with other suspects, he busied himself with hatching plans for the overthrow of the Emperor. Napoleon's absence during the Russian expedition (1812) seemed to offer the long-awaited opportunity. Malet escaped from prison and, by spreading a report of Napoleon's death in Russia, succeeded in gaining over two regiments of the Napoleon Guard. After liberating two of his comrades in prison, Generals Guidal and Lahorie, he attempted to win over Hullin, commandant of Paris, but failed, and, attempting force, was overpowered. The following day Malet, Lahorie, and Guidal were brought before a court-martial and condemned to death, and on October 29 they were executed. Consult Hamel, *Histoire des deux conspirations du général Malet* (Paris, 1873).

MAL'ET, Lucas. An English novelist. See Harrison, Mary Saint Leger.

MALFATTI, mȧl-fȧt'tē, Giovanni Francesco Giuseppe (1731–1807). An Italian mathematician, born at Ala di Trento. His early education was begun at Trento, but at the age of 12 he was sent to Verona, where he entered a college. There he showed such remarkable mathematical ability that he was invited to Bologna at the age of 17, where he carried on his studies at the university, coming under the influence of Riccati in mathematics and Bassi in physics. In 1771 he was made professor of higher mathematics at Ferrara, a position which he filled for about 30 years. Malfatti is chiefly known to-day for an interesting problem which he proposed in a memoir published in 1803, and of which he gave the first solution. The problem is as follows: in a triangular prism to inscribe three cylinders of altitude equal to that of the prism and of maximum volume, so that the remaining volume of the prism shall be a minimum. The problem reduces to the simpler one: to inscribe in a given triangle three circles each tangent to the other two and to two sides of the triangle. It is a curious fact that the same problem was given by the Japanese mathematician Ban Seiyei in 1781 with an algebraic and involved solution. A simpler solution was given by Ajima Chokuyen (1739–98) a little later. For an isosceles triangle the problem appears in the *Opera* of Jakob Bernoulli (Geneva, 1744). The history of the problem has been written several times. Consult: Wittstein, *Geschichte der Malfattischen Problems* (Munich, 1817); Boncompagni, *Bullettino di bibliografia e di storia delle scienze matematiche e fisiche*, vol. ix (Rome, 1876); also Baker, "The History of Malfatti's Problem," in the *Bulletin of the Philosophical Society of Washington*, vol. ii (Washington, 1874).

MALFEA'SANCE (Fr. *malfaisance*, evildoing, from *malfaisant*, doing evil, from *mal*, from Lat. *malus*, bad + *faisant*, pres. p. of *faire*, from Lat. *facere*, to do). The doing of an unlawful act. It is distinguished by the fact that it consists in a positive and active breach of duty from *misfeasance*, which is the performance of a duty in an unlawful or improper manner, especially in a culpably negligent manner, and from *nonfeasance*, which is the total omission to perform an act which one is under a duty to perform. An agent or servant is always personally liable for malfeasance, although the unlawful act has been commanded or ratified by the principal or master. It is often provided by statute that malfeasance in office shall subject the offender to removal from office or other position of trust or even to criminal prosecution. In such connection the term has been uniformly interpreted as involving the idea of evildoing, of conscious transgression of legal duty. An administrator or executor, a guardian, a trustee of a private fund, or a director of a corporation, or any person in like position, is guilty of malfeasance when he wrongfully diverts the assets of the estate or the corporation, or when he mingles them with his own funds and uses them for his own purposes. See Misfeasance; Nonfeasance; Tort; and consult the authorities referred to under Criminal Law; Tort; Trust; etc.

MAL'FORMA'TION (from Lat. *malus*, bad + *formatio*, formation, from *formare*, to shape, from *forma*, shape). The abnormal process which gives rise to an organ or a whole plant whose form is strikingly different from the ordinary; by metonymy, the organ or plant itself, also called a monstrosity. The term "malformation" is applied most properly to a grotesque form, and particularly to one in which the departure from the normal is apparently unrelated to its function. The term "cecidium" has been proposed to include galls and malformations, the cause being indicated by prefixes. That branch of biological science which deals with malformations is known as teratology.

The distinction between malformations and variations is wholly arbitrary. Almost all cultivated plants have been brought to their present state of perfection by cumulative selection, the desired variations being fixed by proper breeding until a race has been developed. The organs in these cultivated races, however, differ from those of the wild original oftentimes far more than do those aberrant forms which are called malformations. The one, however, has arisen slowly by gradations; the other has appeared suddenly. Suddenness of origin, therefore, is one of the criteria of malformation. Malformations may be due to any local disturbance of the usual course of growth and development; e.g., local or general disease. Local disease is often produced by the presence of either an animal or a plant parasite, which produces malformations known as galls. Other malformations are due either to the action of external conditions, such as light and moisture, or to causes which, being entirely unknown, are assumed to be internal. Little has as yet been done in the experimental study of malformations, but since plant organs are remarkably plastic, it is scarcely to be doubted that the specific action of external agents will yet be demonstrated. In very few cases, however, can explanation of the origin of malformations be given at present. There is no question that, having once occurred, malformations may be transmitted to the offspring. Horticulturists are familiar with many instances of this. Malformations are known in all groups of plants, especially among the larger ferns and seed plants. Nearly 4000 species in these two groups have produced monstrosities which have been described. Only a few of the more important classes of deviation from the normal can be mentioned.

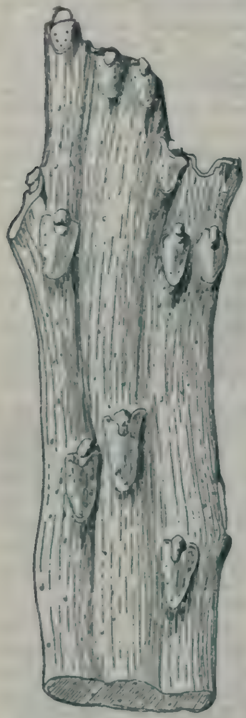


FIG. 1. FASCIATED SHOOT OF AILANTHUS. (AFTER BAILEY.)

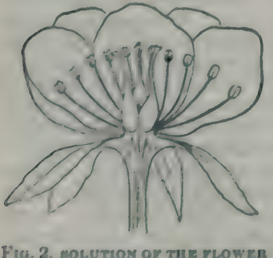


FIG. 2. SOLUTION OF THE FLOWER PARTS.

Longitudinal section of apple blossom. The calyx, petals, and stamens are normally closely united into a mass about the pistils. Here each set is distinct.

1. *Suppression.*—For unknown reasons organs may entirely fail to appear, or they may be arrested in a very young state, so that they do not become evident, or they may be dwarfed by stoppage of growth when partially developed. All possible gradations occur between organs of normal size and those that are completely suppressed. 2. *Hypertrophy.* — From equally unknown causes an organ may develop to an extraordinary size without undergoing any noteworthy change in form. It is common to ascribe hypertrophy to an excessive supply of food, but other stimuli must certainly operate. Young shoots of heavily pruned trees or suckers from the stems often have all organs immensely enlarged. 3. *Concrescence* is a term applied to the actual union of parts in the course of their development. Such unions are not common, most of the cases of apparent union being explicable in an entirely different fashion. Thus the apparent union of flower parts is due to the growth of a ring of tissue underneath the developing separate rudiments, carrying these upward on the edge of a growing cup or cylinder. (See FLOWER.) Actual union is due to the adhesion of young surface cells of organs which are closely crowded as they are forming. The union is seldom firm, and slight pressure suffices to separate the adherent parts without tearing. 4. *Fasciation.* — Stems, normally cylindrical, sometimes develop in a flattened form, several to many times the ordinary diameter in one direction and not unusually thickened in the other. (Fig. 1.) Not infrequently one edge of this broad stem grows more rapidly than the other, when it becomes curved edgewise, crosier-like. The ridges and grooves on the surface suggest the union of several normal stems. Contrary to appearance, however, such stems are not ordinarily due to congenital union of independent stems, each from a single bud, but are produced by the simultaneous development of several buds in line. Fasciation is very common in rapidly growing stems, which are abundantly supplied with food and water. The young shoots of asparagus, the flower stalks (scapes) of the dandelion, and young shoots from severely pruned trees frequently furnish fine examples. 5. *Solution.*—In most seed plants some of the foliar or floral structures are ordinarily developed in circles or whorls or in a crowded spiral. If nowhere else, this is certain to occur in the flowers. (Fig. 2.) Sometimes the stem develops between the points of attachment of these normally crowded leaves, separating them unusually. Thus it comes that flower leaves are sometimes separated by considerable lengths of stem, and the flower loses its characteristic form. Not infrequently at the same time the petals lose their brighter hues and become greenish. 6. *Proliferation* is a continued growth of an axis whose growth is normally finished, or the development of a branch from growing points which ordinarily either are not formed at all or remain dormant. Thus, the formation of a flower usually checks the terminal growth of the axis on which it occurs, but in the pear and apple it not infre-

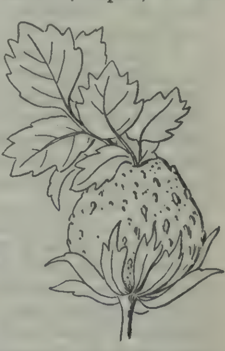
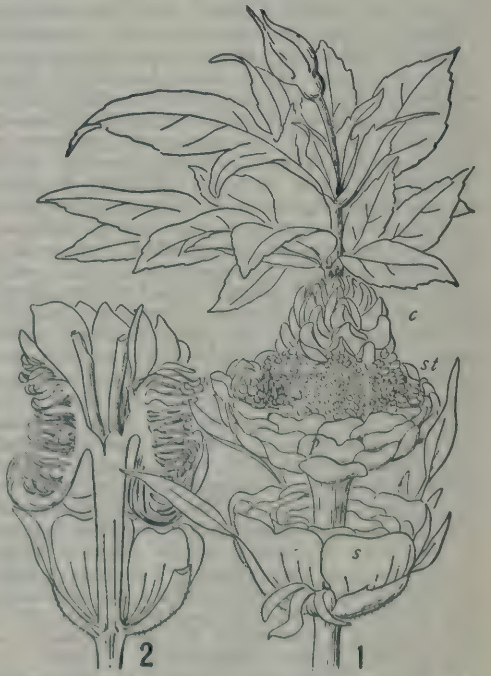


FIG. 3. PROLIFERATION.

Strawberry with axis normally stopped by flower prolonged into a leafy shoot after fruiting.



2. Longitudinal section. 1. External view.

FIG. 4. PROLIFEROUS ROSE.

The "hip" is absent; sepals, *s*, leaflike; petals, *p*, unaffected; above them a circle, *st*, of miniature roses with numerous petals, stamens, etc.; *c*, scales in many rows; above those a whorl of five foliage leaves. The axis is prolonged above the calyx and beyond the scales, carrying foliage leaves and a flower bud.

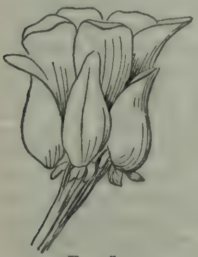


Fig. 5.

Regular peloria of violet, five-spurred sepals replacing the normally single one.

quently resumes its growth after the fruit has begun to form and develops a leafy twig beyond it. (Fig. 3.) In a similar way a flower cluster, such as the head in asters and sunflowers, ordinarily checks the growth of the axis, but occasionally it is prolonged through the cluster, leaving it surrounding the stem. While branches ordinarily occur in the axils of foliage leaves, they do not usually develop in the axils of floral leaves. This may occur, however, and a short branch bearing a complete flower may arise in the axil of each petal or sepal. (Fig. 4.) Some double flowers are made extra-double by this sort of proliferation. A form of proliferation in the flower, when the branches show a tendency to separate readily from the parent, to develop roots, or to become bulblike and reproduce the plant readily, is called vivipary (q.v.). 7. *Torsion.*—Stems normally straight or leaves normally flat may, through more extensive growth of one part or another, be twisted or crinkled.

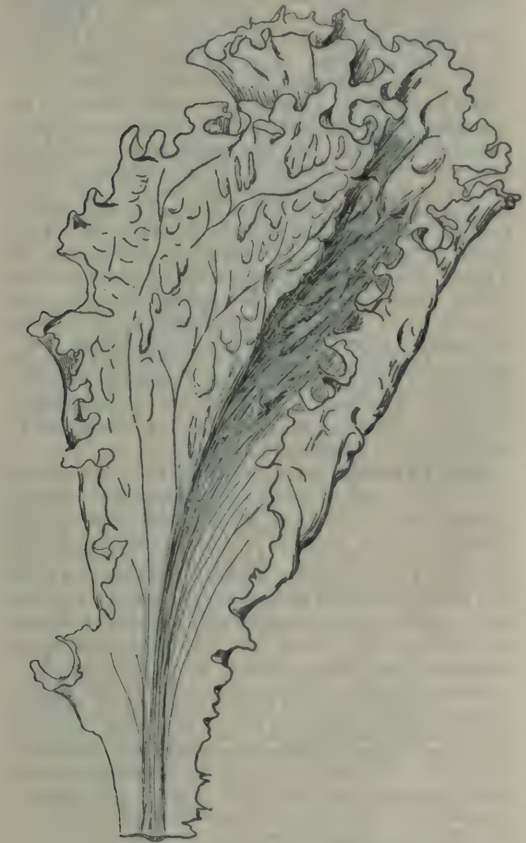


Fig. 6. crispate leaf of lettuce.

Lettuce leaves show a crispate form on a large scale (Fig. 6), and twisted stems are extremely common. 8. *Abnormal branching* of leaves is not infrequent. Clover leaves, normally with three leaflets (branches), are often found with four or five, or even as many as seven. The leaves of the dahlia, hickory (Fig. 7), and many other plants show similar deviations from the normal. Abnormally repeated branching in flower clusters is also common. (Fig. 8.) 9. *Peloria.*—Irregular flowers, i.e., those in which some parts are larger or of a different shape from the others, sometimes develop all the parts of like form and size. Thus the yellow and orange flower of butter and eggs or toadflax has usually one spurred petal; but not infrequently all five of the petals become spurred, and the flower is then radially symmetrical. (Fig. 5.) A similar but reverse change occurs when flowers which are radially symmetrical become unsymmetrical, as when the tubular ray flowers of the wild chrysanthemum or aster develop ligulate corollas. This is quite as monstrous a form as the opposite, but has not been included among malformations.

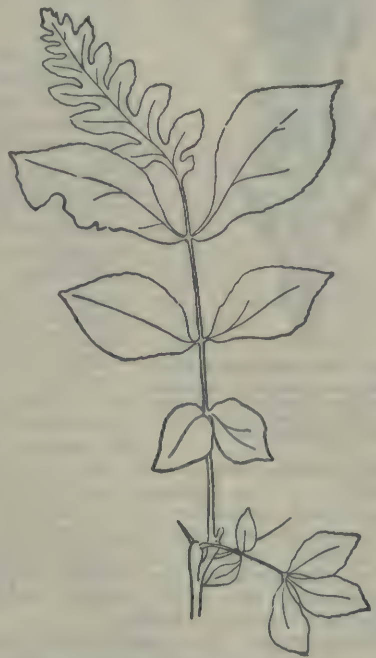


Fig. 7. leaf of hickory.

Showing abnormally branched terminal leaflet.

10. *Transformation* of floral parts is extremely common. Thus, sepals, normally green, may grow into petal-like form and color; while petals may take the shape and function of stamens and pistils. Transformation of this sort, i.e., from a less specialized into a more specialized organ, is not so frequent, and the organs are usually very imperfect. Transformation in the other direction, i.e., from specialized to less specialized organs, is so common that they are scarcely thought of as malformations. Thus, pistils and stamens may develop as petals, a transformation which occurs in most double flowers; petals may be transformed into sepals, or even into imperfect foliage leaves. Indeed, all parts of the flower may be developed as irregular green leaves, of which the so-called green roses are a widely known instance. 11. *Pleimomery,* i.e., increase in the number of any group of or-

gans, occurs most commonly in the floral regions. Some double flowers owe their origin purely to this phenomenon. The increase may affect the number of parts in a whorl or the number of whorls. In the Bahía or navel orange an additional number of carpels is regularly produced, and an imperfect fruit develops, inclosed by the larger one. The so-called two-story apples have their origin in a similar change. Occasionally the additional carpels are lateral to the others, in which case an imperfect fruit may be developed alongside the more perfect one.

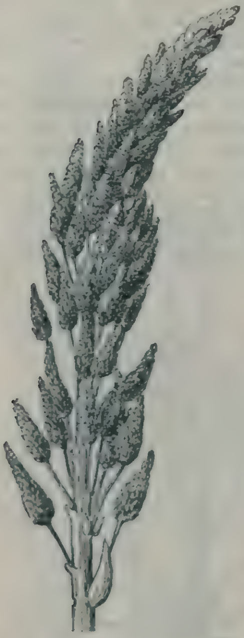


FIG. 8. ABNORMAL BRANCHING.

The flower cluster of plantain abnormally branched; the normal inflorescence is formed of crowded single flowers.

Malformations differ strikingly from galls in the process of their formation, which is due to intrinsic causes, whereas galls result from some extrinsic cause such as the presence in the plant tissues of insects, mites, worms, fungi, slime molds, etc., or from the secretions of these creatures, or from the presence of both organisms and secretions. Like malformations, galls may appear upon the roots, stems, leaves, or flowers and may present very diverse abnormalities, particularly as to their external form and to the peculiar and special tissues which compose them.

Bibliography. The most important works are the following: Moquin Tandon, *Eléments de tératologie végétale* (Paris, 1841); Masters, *Vegetable Teratology* (London, 1869); Penzig, *Pflanzenteratologie* (Genoa, 1890–94), in which the extensive literature up to its date is cited. See GALLS. For malformations in human anatomy and physiology, see DEFORMITIES; MONSTROSITY.

MALHERBE, má′lârb′, FRANÇOIS DE (1555–1628). A French poet and critic, born at Caen. Though Malherbe himself wrote very little poetry of any value, he did much to imbue his contemporaries with a critical sense. Malherbe came after the individualism of the Renaissance had spent its originality. Intellectual lassitude found its expression in criticism, and this found its natural voice in Malherbe, who expressed exactly the state of mind of the cultured men of his time and heralded all that is typical in the literature of the age of Louis XIV, though he was far from typical of its varied genius. With him the temper of mind that prefers order and rule to originality and individuality began to dominate French literature. This temper is represented by Malherbe rather than caused by him. His *Works* (1630), besides translations and correspondence of much historic interest, consist of 125 poems and a *Commentaire sur Desportes*. The only poem that survives in popular memory is the rather frosty *Ode of Consolation* to his friend Du Perrier on the loss of his daughter. Malherbe had a cosmopolitan training in Normandy, Paris, Heidelberg, and Basel and enjoyed court patronage through life. It was this that gave authority to his linguistic and rhetorical dicta, which helped essentially to make the French of Paris the standard for France and to give French thinkers the ideal of logical precision and clarity that has since been their enduring characteristic. His exaggeration of the value of correct diction and prosody was at the time a necessary protest against the careless negligence of genius, though his ideas were carried to excess by his critical successors, of whom the chief was Boileau (q.v.). Malherbe, though he loved to be called a tyrant of words, was a student of popular phraseology, even to the language of the markets, and took thence, as he did from his poetic predecessors, whom also he affected to depise, what he found to his purpose. His *Works*, first collected in 1630, were reëdited in 1666, 1757, 1842, and best by Lalanne (5 vols., Paris, 1860–65). These editions contain the *Life* by Racan, Malherbe's contemporary and pupil. Among the more recent studies of Malherbe may be named Gasté, *La jeunesse de Malherbe* (Paris, 1890); Brunot, *La doctrine de Malherbe* (ib., 1891); Allais, *Malherbe et la poésie française* (ib., 1892); Arnould, *Anecdotes inédites sur Malherbe* (ib., 1892); Bourrienne, *Malherbe* (ib., 1893); id., *Points obscurs et nouveaux de la vie de Malherbe* (ib., 1895); Duc de Broglie, *Malherbe* (ib., 1897).

MALI, mä′lė̄, CHRISTIAN (1832–1906). A German painter, born at Broekhuizen, near Utrecht, Holland. He was early taken to Württemberg, where he practiced wood carving. After his removal to Munich in 1857 he took up landscape painting. A visit to Italy suggested architectural subjects, and studies in Düsseldorf and Paris, where he was influenced by the works of Troyon, led him to the production of pictures in which animals formed the prominent feature. Specimens of these various phases are a "View in Verona" (1866) and "Bavarian Alpine Pasture" (1890), both in the New Pinakothek at Munich; "Shepherd's Morning Greeting," in the Stuttgart Gallery; "Sheep in an Approaching Storm"; "Morning near Amalfi." He received a gold medal in London in 1876.

MALIBRAN, má′lė̄′bräɴ′, MARIA FELICITA (1808–36). A French mezzo-soprano opera singer, born in Paris. She was the daughter of Manuel García (1775–1832), the famous Spanish teacher of singing. At the early age of seven she was a pupil of the famous Panseron; at 15 she became a pupil of her father and two years later made an extraordinarily successful début in London, after which her father attempted to establish the Italian opera in New York, but without success. There she married M. Malibran, a Frenchman. After her husband's failure in business she returned to the stage and was received with great enthusiasm in France, England, Germany, and Italy. Her first marriage having been dissolved, she married De Bériot, the famous violinist, in 1836; but in September of that year she died at Manchester, whither she had gone to take part in a musical festival. Malibran was a woman of generous impulses and magnetic personality, which, coupled with a voice of unusual range and flexibility, served to make her one of the most popular and successful prima donnas of modern times. Consult: I. Nathan, *Life of Mme. Maria Malibran de Bériot* (London, 1846); Arthur Pougin, *Marie Malibran, histoire d'une cantatrice* (Paris, 1911; Eng. trans., London, 1911); *Clément Languine, La Malibran* (Paris, 1911).

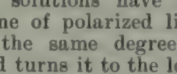
MALIC (mā'lĭk) **ACID,** $C_4H_6O_5$. An organic substance of which two modifications are theoretically capable of existence. The two possess the same chemical properties and differ from each other only in one of their optical properties, viz., the direction in which they rotate the plane of polarized light.

1. The modification of malic acid that is usually met with is found widely distributed in the plant world. The name malic is derived from the Latin *malum*, an apple, the acid having been first discovered by Scheele in unripe apples (1785); but the acid occurs also, either in the free state or combined in the form of salts (*malates*), in gooseberries, currants—in fact, in most acidulous fruits. It may be readily prepared by boiling the expressed juice of unripe mountain-ash berries with milk of lime and dissolving the precipitated neutral calcium salt in hot nitric acid diluted with water; the acid calcium salt thus produced is decomposed with oxalic acid, the precipitated calcium oxalate removed by filtration, and the filtrated solution of malic acid evaporated to dryness. In this manner malic acid may be obtained in the form of colorless, deliquescent crystals that melt at 100° C. (212° F.) and are readily soluble in water and in alcohol. The solutions have the power of turning the plane of polarized light to the left. If kept for a considerable time at a temperature of about 150° C. (302° F.), malic acid loses the elements of water and is largely transformed into fumaric acid (q.v.).

2. The second modification of malic acid may be obtained by the reduction of ordinary tartaric acid. It also occurs, though rarely, in nature. Its solutions have the power of turning the plane of polarized light to the right, and that to the same degree to which ordinary malic acid turns it to the left.

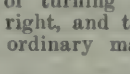
An optically inactive malic acid, which is really nothing but a mixture of equal quantities of the two modifications just described, may be prepared by a variety of chemical methods; it has been obtained from mono-bromo-succinic, fumaric, and malic acids, and from certain other substances. Though quite similar in its properties to the optically active modifications, it is found to be less soluble in water, to crystallize somewhat more readily, and to form crystals that are not deliquescent. The separation of its components may be effected by the crystallization of their cinchonine salts, which differ from each other to a marked degree in their physical properties.

Chemically, malic acid is a hydroxy-derivative of succinic acid, into which it is readily converted by the action of hydriodic acid at a high temperature. The chemical relationship of malic and succinic acids is shown by their constitutional formulas:



$$\begin{array}{l}\mathrm{CH(OH).COOH}\\ |\\ \mathrm{CH_2.COOH}\end{array}$$

Malic acid



$$\begin{array}{l}\mathrm{CH_2.COOH}\\ |\\ \mathrm{CH_2.COOH}\end{array}$$

Succinic acid

According to the thory of stereochemistry (q.v.), the existence of two modifications of malic acid is due to the fact that the molecule of the acid contains a carbon atom to which four different atomic groups are linked, viz., H, OH, COOH, and CH_2COOH. See Succinic Acid.

MAL'ICE (OF., Fr. *malice*, from Lat. *malitia*, badness, from *malus*, bad). In the most general sense, an evil or vindictive state of mind; in a more specific and technical sense, the mental attitude of one who does an unlawful act knowingly and willfully. It is in the former sense that the term is employed in defining the offenses of malicious mischief and of malicious prosecution. In neither of these cases is it enough to establish the fact that the defendant knowingly did the act of which he is accused or that he contemplated the consequences which must result from the act. In a prosecution for malicious mischief an evil disposition on the part of the accused must be shown, while in an action for malicious prosecution it must be made to appear that the defendant knew that there was no reasonable and probable cause for the prosecution instigated by him, from which the motive of actual malice will be inferred. The same distinction between intent and malice is drawn in prosecutions for trespass, the punitive or vindictive damages awarded in such cases being aggravated by proof of ill will or actual malice on the part of the defendant. On the other hand, malice, even though the motive of an act which injures another in his person or property, will not furnish grounds for an action unless the act inspired by it is itself unlawful. Except in a few American jurisdictions, it is uniformly held that the malicious exercise of a right (as where one erects a "spite fence" for the purpose of interfering with a neighbor's light or, with the motive of destroying a person's business, sets up a competing establishment) is not an actionable wrong. See Malicious Mischief; Malicious Prosecution; Tort; Damages.

In criminal law, on the other hand, malice usually signifies only the "criminal intent" of the wrongdoer, i.e., his purpose to commit the act which the law has forbidden. Malice, in this sense, is a necessary element of most crimes—of all, in fact, except those in which the mere possession of instruments of crime is made a criminal offense by statute. But this does not mean that the accused must have been animated by ill will towards the victim of his harmful act, but only that he willed or contemplated the act. It is no defense to an indictment for murder that the act was inspired by "love" or by a desire to save the victim from the pains of poverty or of a lingering disease. The malice, in such a case, is the purpose or intent to commit the forbidden act, i.e., the killing of another without legal excuse or justification. The employment of the term in this misleading sense has had the effect of seriously confusing the question of criminal responsibility in many cases. See Crime; Guilt; Intent; and articles dealing with particular crimes, as Murder; Burglary; Arson; Larceny; etc. For specific applications of the doctrine of malice, see Libel; Infant; Insanity.

MALICIOUS MISCHIEF. The specific criminal offense of willfully injuring or destroying the property of another from spite or ill will or with an intent to injure the owner. It does not include the unlawful appropriation of another's property, whether by force or fraud, however malicious the motive, nor acts of destruction, such as the wrongful cutting of timber by a tenant for life or years (civilly punishable as *waste*), or by a stranger (giving rise to an action of *trespass*), which are committed with the intent of appropriation and not from ill will. In short, to constitute the offense there must be physical injury to property and the object of the act must be to inflict damage on the owner or possessor. Except in the case of arson (where the motive with which the crime was committed is immaterial), the destruction of another's property, whether willful or not, was not an indictable offense at common law, the only penalty provided being the liability for damages in a civil suit (waste or trespass), though for a willful, and especially a malicious, trespass, punitive damages might be awarded. This defect of the common law was, however, corrected by statute at an early period, and malicious mischief, as above defined, is now a statutory offense both in England and the United States.

One of the leading English statutes is known as the Black Act, from a statement in the preamble that "several ill-designing and disorderly persons have of late associated themselves under the name of Blacks." This and a large number of other statutes were replaced in 1861 by a criminal consolidation Act (24 and 25 Vict., c. 97), which, with its amendments, extends the offense of malicious mischief to malicious injuries to most buildings, to fishponds, and various other classes of real property, and to almost any species of personal property. In the United States most of the State statutes are as sweeping and detailed in their provisions as those of England. In a few jurisdictions, however, the offense is confined to a limited class of injuries to personal property.

The intent with which the injury is inflicted must be malicious. As a rule, that term is used in this class of cases in its ordinary sense; i.e., actual malice must be shown. The Supreme Court of Massachusetts has declared that malice, in this connection, is "not sufficiently defined as the willful doing of an act prohibited by law for which the defendant has no lawful excuse, but the jury must be satisfied that the injury was done out of a spirit of cruelty, hostility, or revenge." Moreover, the malice must be entertained against the owner of the property, not against a third person or the property injured. These doctrines are modified in some States, especially where the statutes define the offense to consist in the willful infliction of unlawful injury. Occasionally a statute makes secrecy in doing the harm an essential element of the crime. In all jurisdictions it is a perfect defense that the injury was inflicted in the discharge of official duty or under an honest, though mistaken, claim of right. The offense is ordinarily classed as a misdemeanor, although in some jurisdictions it is declared a felony. See MALICE; and consult Harris, *Principles of the Criminal Law* (London, 1899); Bishop, *Commentaries on the Law of Statutory Crimes* (3d ed., Chicago, 1901); McClain, *Treatise on the Criminal Law, as now Administered in the United States* (ib., 1897).

MALICIOUS PROSECUTION. The civil wrong or tort of having prosecuted a person unsuccessfully and without probable cause. This was not a criminal offense at common law, but gave rise to a right of action for the injury suffered by the victim of the unjust prosecution. In a few of the American States the act has been made a criminal offense by statute. It is the right of every one to set the law in motion for the punishment of criminal offenses or for the enforcement of his individual claims. The courts have held that "public policy requires that parties may freely enter court to settle their grievances, and that they may do this without imminent exposure to a suit for damages in case of an adverse decision by judge or jury."

In order to recover, the plaintiff must establish by proof: (1) that the prosecution of which he complains was instituted by the defendant; (2) that it has terminated in plaintiff's favor; (3) that in instigating the prosecution the defendant acted maliciously and without reasonable and probable cause; and (4) that plaintiff was damaged by the prosecution.

The reason for requiring a termination of the original suit in the present plaintiff's favor before allowing him to sue for malicious prosecution is that it would not be consistent with the principles on which law is administered for another court, not being a court of appeal, to hold that a wrong decision was made in the original case. But the rule requiring a conclusive determination of the defendant's innocence of the offense for which he was prosecuted has no application to a proceeding which, from its nature, does not admit of such a trial—e.g., the search of one's house under a warrant for the discovery of stolen property or of incriminating evidence. If the search is fruitless and was instituted without probable cause, an action for malicious prosecution is maintainable. But the malice required to sustain such a suit is legal, not actual, malice; i.e., the malice is a legal presumption from the fact that no reasonable cause for the prosecution existed. If the defendant had good and sufficient grounds for instituting the prosecution of which the plaintiff complains, the fact that he was animated by ill will against the latter will not in most jurisdictions render him liable. It is generally held that the successful termination of the former action in the defendant's favor creates a presumption of law that the prosecution was unwarranted, but this presumption may be rebutted by showing that the prosecutor had reasonable cause for instituting it.

The truth of the circumstances alleged to show probable cause is a question of fact to be determined by the jury; but whether, admitting their truth, they amount to probable cause, is a question for the court. Frequently the person sued for malicious prosecution proves that the original proceeding was taken upon the advice of counsel. In order to shield himself behind such advice he must show not only that he consulted reputable and capable counsel, but that the advice was based upon a full and honest disclosure of all the material facts within his knowledge and belief.

Probable cause having been proved, the plaintiff must prove damage. Damage may be shown by proving that the proceeding was of a criminal character or, if a civil suit, that it was attended by an arrest of his person or seizure of his property or injury to his reputation (as in bankruptcy proceedings or an inquiry into his sanity), and in these cases he need give no evidence of special loss. "Such a prosecution necessarily and manifestly imports damages." But if the prosecution complained of was a civil suit, unattended by any of the incidents above referred to, the plaintiff must, in order to recover, show that it resulted in special loss or damage to him. Even though he is able to show this, he will be defeated in England and in many of the United States, on the doctrine that "in contemplation of law the defendant who is unreasonably sued in a civil action is sufficiently indemnified by a judgment in his favor which gives costs against his opponent." Consult: M. L. Newell, *Malicious Prosecution, False Imprisonment, and Abuse of Process* (Chicago, 1892); and the authorities referred to under Tort, such as Sir Frederick Pollock, *Law of Torts* (7th ed., London, 1904); F. M. Burdick, *Law of Torts* (3d ed., Albany, 1913).

MALIG′NANT CATARRH. An infectious disease of cattle which affects mainly the respiratory and alimentary tracts. It usually occurs in an enzoötic form and seems to persist in certain localities. The period of incubation is about three weeks. The disease ordinarily attacks young, vigorous animals and begins with a chill followed by high fever. The eyelids become swollen and the tear formation is abundant. The eyes are unusually sensitive to the light. There are thick bloody discharges from the nose and mouth. The mortality from the disease ranges from 50 per cent to 90 per cent, death occurring in from one to four weeks. There is no good specific treatment for the disease. The treatment should be symptomatic. Infected animals should be isolated and stables disinfected. Consult: United States Bureau of Animal Industry, *Special Report on Diseases of Cattle* (Washington, 1909); Hutyra and Marek, *Special Pathology and Therapeutics of Diseases of Domestic Animals*, vol. i (Chicago, 1912); E. W. Hoare, *A System of Veterinary Medicine*, vol. i (ib., 1913).

MALIGNANT DISEASE. A certain disease or type of disease which tends almost inevitably to a fatal issue. The tumors characterized as malignant are cancer and sarcoma. Some epidemic diseases assume, at certain times and in particular cases, a virulent, rapidly fatal form, and this is called the malignant or fulminant type of the disease. Among such diseases are scarlet, typhoid, and malarial fevers, endocarditis, purpura (qq.v.), and cerebrospinal meningitis. Other maladies, such as diphtheria and smallpox, have, through advances in medical knowledge, lost much of the severity that earned for them the title malignant. Smallpox has been almost entirely controlled by vaccination, and diphtheria rendered much less dangerous by the discovery of antitoxin; yet malignant cases of both these diseases occasionally occur. Among other diseases which, on account of their severity, have at one time or another been termed malignant are Asiatic cholera, bubonic plague, pernicious anæmia, acute yellow atrophy of the liver (malignant jaundice), and anthrax (malignant pustule).

MALIGNANT PUSTULE, or Anthrax; Wool-Sorters' Disease; Charbon; Milzbrand. An infectious disease produced by a rodlike bacillus, the *Bacillus anthracis*. It begins as an acute local inflammation. General infection may result. It is a very serious and generally fatal affection. Herbivorous animals are especially susceptible; less so the omnivora, and least of all the carnivora. It may occur in any part of the world. In man, the disease is always acquired from affected animals. Any part or tissue of an animal dead from anthrax is capable of communicating the disease. The dry bacillus can preserve its virulence for many years, and through any substance to which it may become attached the disease may be communicated; even the feet and proboscides of flies which have alighted upon the diseased animal (having in its tissues the bacillus) or upon the infected product may carry the disease. Ants and earthworms are believed to carry it from the buried animals to the grass above. Some minute scratch, abrasion, or insect bite may suffice for the inoculation; after this has taken place there come, in a few hours, itching and uneasiness. A pimple and then a blister follow, surrounded by a brawny induration of the skin; and œdema, with great swelling of the parts. The inflammation extends along the lymphatics and the neighboring lymph glands are swollen and tender. There is often high fever. Sometimes in the eyelid, and also in the head, hand, and arm, there may be very great œdema, so that gangrene may result. The constitutional symptoms are generally very grave.

The infection may be by way of the digestive tract, from eating the flesh or drinking the milk of diseased animals. There is then intense poisoning. A chill occurs followed by a fever, with vomiting, diarrhœa, and pains in the legs and back. There may then be shortness of breath, cyanosis, great anxiety and restlessness, and convulsions or spasms of the muscles. There may be hemorrhages from the mucous membranes. Malignant pustule may affect many individuals together, making a veritable epidemic. The site of inoculation must be destroyed by cautery or caustic. Injections of carbolic acid under the skin around the point of inoculation may prevent the spread of the infection. Internally, quinine and stimulants are appropriate. Sclavo's antianthrax serum has been used with success and should be given when obtainable. See Carbuncle; Anthrax.

MALIGNANTS. A sobriquet applied by the English Parliamentarians, in 1634 and subsequently, to those who adhered to the house of Stuart and refused to sign the Solemn League and Covenant, for which see Covenants, The.

MALIGNANT TUMOR. See Tumor.

MALIGNITE, mȧ-lĭg′nīt (named from the Maligne River, Ontario). An igneous rock, in aspect resembling a coarse-grained basalt (q.v.), but composed of about equal quantities of ægirine-augite and biotite, and of orthoclase feldspar and nephelene. Its relationships are closest with theralite and nephelene basalt.

MALÍNAO, mȧ-lē′nou. A town of Luzon, Philippines, in the Province of Albay. It is situated on the southwest shore of the Gulf of Lagonoy, 18 miles northwest of Albay, on the main highroad. It exports large quantities of hemp. Near by are found mineral springs and the extinct volcano Malínao. Pop., 1903, 12,437.

MALINES, mȧ′lēn′. A town of Belgium. See Mechlin.

MALING′ERING. The feigning of disease is common either for the purpose of exciting pity, to escape punishment for crime, to avoid military service, or for the sake of material gain, as in the case of professional beggars and those who bring action against transportation companies for alleged injuries. The malingerer may manufacture his symptoms entirely or merely exaggerate real symptoms. These affections are most easily simulated which present few marked characteristics to the ordinary observer, i.e., they must be subjective rather than objective. The expert is rarely deceived. Thus, pain, deafness, blindness, paralysis, and various degrees of insanity are simulated. The feigning of insanity by murderers in particular has become a common practice in some States. Transitory loss of mental balance due to emotional excitement or superinduced by excessive indulgence in alcohol or drugs is frequently alleged by wealthy or influential murderers in cases where the actual killing cannot be denied. This, when backed by a corroborative family history, the possession of certain physical stigmata, or eccentricities of behavior, real or assumed, and reënforced by an impressive array of expert evidence, has too often influenced juries to acquit the criminal or mitigate the severity of the verdict. Some cases of malingering have a basis in hysteria or neurasthenia; such patients are introspective and imaginative and often feign nervous maladies with surprising fidelity to nature. The expert can nearly always detect the imposture, but the sympathetic lay observer is readily deceived. In those countries where military service is compulsory, malingering, supplemented by deliberate maiming, as the destruction of one eye or the production of chronic discharge from the ears, is quite extensively practiced. To detect the malingerer various and ingenious tests have been devised. Pretended blindness and deafness can always be detected by appropriate tests. The X ray will show the presence or absence of a fracture. Simulated epilepsy may be detected by administering a pinch of snuff or a hypodermic injection of apomorphin. The electric current is employed to detect pretended unconsciousness and to differentiate many nervous diseases; and general anæsthesia will test the veracity of feigned muscular contractures, paralysis, wry neck, and similar conditions. Consult W. R. Smith, *Medical Jurisprudence* (London, 1913), and John Callie, *Malingering and Feigned Sickness* (New York, 1913). See Disease, *Feigning of Disease.*

MALINITZIN. See Marina.

MALL, mąl, măl, or mĕl, The. 1. An avenue on the north of St. James's Park, London, lined with rows of fine trees. 2. An avenue in Central Park, New York, extending from the Terrace and forming with the latter one of the most successful landscape effects of the park.

MALL, mąl, Franklin Paine (1862–1917). An American anatomist, born at Belle Plaine, Ia. He graduated M.D. from the University of Michigan in 1883, and studied also at the universities of Heidelberg and Leipzig, and at Johns Hopkins, where he was fellow (1886–88), instructor in pathology (1888–89), and professor of anatomy after 1893. He served also as adjunct professor of vertebrate anatomy at Clark University (1889–92) and as professor of anatomy at the University of Chicago (1892–93). In 1905–07 he was president of the Association of American Anatomists. He became coeditor of the *Handbuch der Entwicklungsgeschichte des Menschen*, the *American Journal of Anatomy*, the *Anatomical Record*, and the *Journal of Morphology;* and he is author of *Causes Underlying the Origin of Human Monsters* (1908).

MALLALIEU, măl'lȧ-lū', Willard Francis (1828–1911). A Methodist Episcopal bishop. He was born at Sutton, Mass.; graduated at Wesleyan University in 1857; and entering the ministry the next year was pastor of churches at Sutton, Boston, Chelsea, South Boston, and Worcester, Mass. He was presiding elder of the Boston district in 1882–84, a member of General Conferences (1872, 1876, 1880, and 1884), was elected Bishop in 1884, and was a member of the Ecumenical Methodist Conference of 1891. His official episcopal residences were New Orleans (1884–92), Buffalo (1892–96), and Boston (1896–1904). He was retired from active work by the General Conference of 1904. He was the author of *The Why, When, and How of Revivals* (1901); *The Fullness of the Blessing of the Gospel of Christ* (1903; Spanish trans., 1909); *Words of Cheer and Comfort* (1907).

MAL'LARD (OF. *malard, malart*, probably from *male, masle*, male, from Lat. *masculus*, male, from *mas*, man). A handsome wild duck (*Anas boschas*, or *platyrhynchos*), found in most parts of the Northern Hemisphere outside of the tropics. It is about 2 feet long and weighs two or three pounds. The female has dusky and tawny-brown feathers, but the plumage of the male is glossy green on the head, purplish chestnut on the breast, black on the back, and a finely crossbarred silver gray on the belly. He also has a tuft of curly feathers above the tail. The mallard is the well-known original stock of the common domestic duck, and in its breeding and other habits it closely resembles barnyard birds. It is rare in New England, and breeds mostly north of the United States, making its nest on the ground in a marsh and lining it copiously with feathers. See Duck; and Colored Plate with Water Birds.

MALLARD, mȧ'lär', François Ernest (1833–94). A French engineer and mineralogist, born at Châteauneuf-sur-Cher. He entered the Ecole Polytechnique in 1851 and two years afterward passed to the School of Mines, where he was appointed professor of mineralogy (1872). In 1886 he was made an inspector general with supervision over the departments of the Northeast. He became a member of the Academy of Sciences in 1890. Besides a great number of memoirs on scientific subjects he wrote an important *Traité de cristallographie géométrique et physique* (1879–84), and produced a *Carte géologique du département de la Haute-Vienne.*

MALLARMÉ, mȧ'lär'mȧ', Stéphane (1842–98). A symbolistic French poet, born in Paris. He was professor of English in the Lycée Fontanes. More than Paul Verlaine (q.v.), Mallarmé led the Symbolistic school of poetry. In 1876 he aroused attention with *L'Après-midi d'un faune*, illustrated by the painter Manet. In 1878 appeared his *Petite mythologie à l'usage des classes et du monde.* In 1880 he published *Les dieux antiques: nouvelle mythologie* and Beckford's *Vathek*, with a preface; in 1886, a translation of Poe's *Raven;* in 1887, *Poésies.* His rendering of Poe's *Poems* appeared in 1888; *Vers et prose* in 1893. Some readers find beauty in Mallarmé, but to most readers his prose and his verse seem willfully obscure. Almost from the outset his poetic efforts were the talk of literary Paris. Some critics regarded him as an unusual phenomenon and tried to explain him. In 1895 Lanson expressed the widespread opinion that Mallarmé was a poet of very slight value. Gaston Paris benevolently remarked that Mallarmé was worthy of study. By the small set of Décadents and by their admirers he was heralded as a writer of the highest order, but he had few readers, and his notoriety soon began to wane. About Mallarmé cluster a score or so of Symbolists. The best known are Henri de Régnier, Jean Moréas, Emile Verhaeren, Fleming, Gustave Kahn, and finally Maeterlinck (q.v.). Consult Edmund Gosse, *Questions at Issue* (New York, 1893), and Francis Grierson, *Parisian Portraits* (London, 1913).

MALLEABIL'ITY (from *malleable,* Fr. *malléable,* from ML. *malleare,* to beat with a hammer, from Lat. *malleus,* hammer). The property which certain metals possess of being reducible to thin leaves, either by hammering or by lamination between rollers. The order in which the malleable metals exhibit this property is as follows: gold, silver, copper, platinum, palladium, iron, aluminium, tin, zinc, lead, cadmium, nickel, cobalt. Gold far surpasses all the other metals in malleability, being capable of reduction into films not exceeding the 200,000th of an inch in thickness; silver and copper also may be reduced to leaves of great tenuity. Although gold and silver also present the property of *ductility* (q.v.) in the highest degree, there is no constant relation between the two properties; e.g., iron, although it may be reduced to extremely thin wire, is not nearly so malleable as gold, silver, or copper.

MALLECO, mȧ-lyā'kō. A province of Chile, bounded by Argentina on the east, the provinces of Cautin on the south, Bio-Bio on the north, and Arauco on the west (Map: Chile, E 5). Its area is 2973 square miles. It is mountainous in the eastern and western parts and is well wooded. Timber and wheat are the chief products. The province is traversed by two railway lines. Pop., 1885, 58,983; 1895, 98,032; 1907, 109,775. A considerable portion of the population consists of Araucanian Indians. The capital is Angol (q.v.).

MALLEE (măl'ē) **BIRD.** See MOUND BIRD.

MAL'LERY, GARRICK (1831–94). An American ethnologist and soldier, born at Wilkes-Barre, Pa. He graduated at Yale in 1850 and practiced law in Philadelphia until the outbreak of the Civil War, when he enlisted in the Federal army, in which he rose to the brevet rank of colonel. He was connected with the Signal Service Bureau in 1870–76, made investigations among Dakota and other western tribes of Indians in 1876–79, and from 1879 until his death he was ethnologist of the Bureau of Ethnology. Among his publications are: *The Former and Present Number of our Indians* (1877); *A Calendar of the Dakota Nation* (1877); *Introduction to the Study of the Sign Language among the North American Indians* (1880); *Pictographs of the North American Indians* (1886); *Israelite and Indian: A Parallel in Planes of Culture* (1889); *Picture Writing of the American Indians* (1893).

MAL'LESON, GEORGE BRUCE (1825–98). An Anglo-Indian official and historian, born in London. He was educated at Winchester and served 35 years in India, 10 of which were in the army and the rest in government positions. He was sanitary commissioner to the government of India (1866–68), comptroller general of military finances (1869), and the guardian of the Maharajah of Mysore (1869–77). He obtained the rank of colonel in 1873. He died March 1, 1898. Malleson wrote many books, dealing mostly with India, of which the best is *The French in India* (1868) and the longest is *The History of the Indian Mutiny* (1878–80), a continuation of Sir John Kaye's *History of the Sepoy War.* Among his other works are: *Recreations of an Indian Official* (1872); *Final French Struggles in India* (1878); *History of Afghanistan* (1879); *The Founders of the Indian Empire* (1882); biographies of Akbar (1890), Dupleix (1890), Clive (1882), Hastings (1894), Wellesley (1889); *The Refounding of the German Empire* (1893); *Lakes and Rivers of Austria, Bavaria, and Hungary* (1897).

MAL'LET (originally **MALLOCH**), DAVID (c.1705–65). A Scottish writer and poet, born near Crieff (Perthshire). He studied at Edinburgh University and afterward lived principally in London, where for some time he was one of the secretaries of the Prince of Wales. He changed his name to Mallet when he went to live in England. He was at first a friend and admirer of Pope, but to please his patron, Bolingbroke, he attacked Pope's memory in a preface he wrote for Bolingbroke's *Patriot King* (1749). Mallet again sold his pen during the popular indignation against Admiral Byng in 1757. His works include: *William and Margaret* (1723); *The Excursion* (1728); *Verbal Criticism* (1733); *Amyntor and Theodora, or the Hermit* (1747), poems; and some mediocre plays. He also published two volumes of *Poems on Several Occasions* (1743, 1762). An edition of his works appeared in 1759.

MALLET, JOHN WILLIAM (1832–1912). An American chemist, son of Robert Mallet. He was born in Dublin, was educated there at Trinity College and at Göttingen, and in 1853 came to the United States to become chemist of the Geological Survey of Alabama. He was professor of chemistry in the University of Alabama (1855–60) and in the State Medical College until the Civil War. Mallet served on General Rodes's staff and as manager and director of the ordnance laboratories of the Confederate States. After the war he was professor of chemistry at the University of Louisiana until 1868; then he went to the University of Virginia, where he became emeritus professor of chemistry in 1908. In 1882 he served as president of the American Chemical Society. With his father he prepared for the British Association a catalogue of earthquakes (1858). Alone he published: *Cotton* (1862); *Chemistry Applied to the Arts* (1868); *Syllabus of a Course of Lectures on General Chemistry* (1890; rev. ed., 1901); and contributions to chemical journals.

MALLET, ROBERT (1810–81). An Irish civil engineer, born in Dublin, where he graduated B.A. from Trinity College in 1830. He engaged in various industrial-engineering, bridge-building, and railroad operations; built the Fastnet Rock Lighthouse in 1848–49; invented the Mallet buckled plate in 1852; and became a consulting engineer in London in 1861. He was elected a fellow of the Royal Society in 1854. His scientific work, especially in regard to his investigations of the causes of volcanic action, won him the Wollaston medal in 1877. He published: *The Earthquake Catalogue of the British Association* (1858), with his son J. W. Mallet (q.v.); *Great Neapolitan Earthquake of 1857* (2 vols., 1862); *The First Principles of Observational Seismology* (1862). He edited the *Practical Mechanic's Journal* in 1865–69.

MALLINGER, mäl'ĭng-ĕr, MATHILDE (1847–1920). A celebrated Hungarian dramatic soprano, born at Agram. She received her first instruction from her father, then studied for two years (1863–65) at the Prague conservatory and for one year with Richard Lewy in Vienna. In 1866 she made her début in Munich as Norma, where her extraordinary success immediately led to a three years' engagement. Her splendid voice and histrionic ability attracted the attention of Wagner, who chose her as the original interpreter of Eva in *Die Meistersinger* (1868). In 1869 she was married to Baron Schimmelpfennig and removed to Berlin, where she was one of the brightest stars of the Royal Opera until 1882. She then retired from the stage at the height of her fame and powers. From 1890 to 1905 she was professor of singing at the Prague conservatory, returning to Berlin as a member of the Eichberg Conservatory.

MALLOCH, mål′ŏk, David. See Mallet, David.

MAL′LOCK, William Hurrell (1849–). An English writer on social and religious questions. He was born in Devonshire and was educated at Balliol College, Oxford, where he won the Newdigate prize of 1872 with a poem on *The Isthmus of Suez.* He was intended for a diplomatic career, but devoted himself entirely to literature, spending a considerable part of his life in southern and eastern Europe. His writings, even in fiction, are generally occupied to a large extent with current problems of thought and life. In philosophy he aimed to show that modern science can of itself offer no firm basis for ethical or religious theory. Under this head comes *Atheism and the Value of Life* (1884); but his most powerful book in this class, *Is Life Worth Living?* (1879), is a cogent criticism of the Positivist position as set forth by its own advocates. In this book, and still more in *Doctrine and Doctrinal Disruption* (1900), he argues for a sure dogmatic foundation for religious belief, and his logic favors the Roman Catholic church, with which, however, he did not actually connect himself. In *The New Republic* (1877), under thin disguises, several of the most famous Englishmen of the time appear and discuss many of the great problems of life. Two novels, *A Human Document* (1892) and *The Heart of Life* (1895), are largely occupied with modern aspects of the relations of the sexes, as is to a certain extent *A Romance of the Nineteenth Century* (1881). *The Old Order Changes* is a counterblast to Socialism under the form of fiction, and this is the standpoint of various important economic works—*Social Equality* (1882); *Property and Progress,* an answer to Henry George (1884); *Classes and Masses* (1896); and especially *Aristocracy and Evolution* (1898). Among his other publications are: *Religion as a Credible Doctrine* (1902); *The Reconstruction of Belief* (1905); *The Nation as a Business Firm* (1910). His economic and social writings did not grow in authority with the years, and he suffered considerably from unceremonious treatment in Bernard Shaw's *Socialism and Superior Brains* (1910).

MALLOPH′AGA (Neo-Lat. nom. pl., from Gk. *μαλλός, mallos,* wool + *φαγεῖν, phagein,* to eat). An order of wingless parasitic insects, commonly called bird lice or biting lice. The latter name is preferable, since they occur upon mammals as well as upon birds and are distinguished from the true lice of the hemipterous family Pediculidæ (see Louse) by possessing biting mouth parts. They do not suck blood as do the true lice, but feed upon the feathers or hair of the birds or mammals upon which they are found, just as do the bird mites. (See Mite.) The metamorphosis is incomplete; the body is greatly flattened and generally hard; the head is large and flat; the antennæ are short and from three to five jointed; the eyes are simple; and the jaws are usually toothed and pointed. The front legs are short and are used only in carrying food to the mouth, projecting forward beneath the head when the insect is at rest. The other legs are strong, and the whole body is usually rather hairy. The eggs are elongate-oval and are fastened singly to the feathers or hairs of the host animal. The young issue by breaking off a circular lid at the free end of the egg. More than a half dozen species of bird lice, belonging to three distinct genera, have been found upon the common domestic chicken. Nearly all are cosmopolitan species and have been carried to all parts of the world. *Goniocotes hologaster* is the commonest of these although *Goniocotes abdominalis* is also very abundant. *Lipeurus opaculus* is a common form found upon pigeons, and *Lipeurus polytrapezius* occurs abundantly upon turkeys. The domestic cat is often infested by *Trichodectes subrostratus,* and the dog by *Trichodectes latus.* The habit which fowls have of scratching in the dust and throwing it over their backs is an indication that they are infested. The best remedy consists in the free use of pyrethrum or Persian insect powder and of kerosene.

Consult: Herbert Osborn, *Insects Affecting Domestic Animals* (Washington, 1896); V. L. Kellogg, "A List of the Biting Lice taken from Birds and Mammals of North America," in *Proceedings of the United States National Museum* (ib., 1899); id., "New Mallophaga," in *Hopkins Seaside Laboratory Contributions,* Nos. iv, vii, and xix (Palo Alto, 1896–99); Kellogg and Paine, "Mallophaga from Birds of India," in *Records of the Indian Museum,* vol. x (Calcutta, 1914).

MALLORCA, mȧ-lyôr′kȧ. One of the Balearic Islands. See Majorca.

MALLORE, Sir Thomas. See Malory, Sir Thomas.

MAL′LORY, Stephen Russell (1813–73). A cabinet officer in the Confederacy. He was born in Trinidad, West Indies, and in 1832 was appointed by President Jackson inspector of customs at Key West. About 1839 he was admitted to the bar, subsequently served in the Florida War against the Seminole Indians, and from 1851 to 1861 represented Florida in the United States Senate. In the latter year Florida seceded from the Union, and Mallory was appointed Secretary of the Confederate navy, then without a ship. His only preparation for this post, which he held throughout the Civil War, was his experience as chairman of the Senate Committee on Naval Affairs; nevertheless he showed great executive ability in promoting the construction and arming of the Confederate navy. After the war he was imprisoned, but in 1866 was released on parole, went to Pensacola, Fla., and practiced law there until his death.

MAL′LOW (AS. *malwe, mealwe,* from Lat. *malva,* from Gk. *μαλάχη, malachē, μολόχη, molochē,* mallow, probably from *μαλάσσειν, malassein,* to soften, from *μαλακός, malakos,* soft, from Heb. *mallūah,* marshmallow, from *mālah,* to flow, so called probably from its emollient qualities or, less plausibly, from the softness of the leaves), *Malva.* A genus of plants of the family Malvaceæ (q.v.). The species, which number about 30, are herbs, or more rarely shrubs. The common mallow (*Malva sylvestris*), which is plentiful in most of Europe and in America on waysides and heaps of rubbish, is a perennial, with rather large bluish-red flowers on erect stalks. The dwarf mallow (*Malva rotundifolia*), now a common weed in America, has smaller whitish or reddish-white flowers. These two plants and other species are mucilaginous and somewhat bitter. The musk mallow (*Malva moschata*), not unfrequent in America, has a faint musklike smell. The fibre of *Malva crispa* is used in Syria for textile purposes, and the fibres of many species are probably fit for similar use, and for the manufacture of paper. The young leaves of some are said to be occasionally used as boiled vegetables. *Malva alcea* resembles the musk mallow in general appearance and is often cultivated. It is a perennial with deep rose-colored flowers often veined with dark red. A number of cultivated plants are often called mallows, but most of them belong to other genera of the mallow family.

MAL′MA. A vernacular name in Kamchatka, adopted as the specific designation, and sometimes used as the common name, of the bull or Dolly Varden trout (q.v.).

MALMAG. See Tarsier.

MALMAISON, mȧl′mȧ′zôɴ′ (Lat. *mala mansio*, evil dwelling), La. A château near Versailles, France, some 7 miles west of Paris, known as the home of Josephine Beauharnais before her marriage to Napoleon and after her divorce in 1809. The history of the place may be traced to the thirteenth century, when it obtained its name from its reputation as a resort for outlaws.

MALMESBURY, mämz′bẽr-ĭ. A market town in Wiltshire, England, 94 miles west of London (Map: England, D 5). It is an interesting town, picturesquely built on an eminence almost surrounded by the lower Avon. A castle existed here in the seventh century, when a monastery was also founded. The celebrated chronicler William of Malmesbury was a monk in the abbey, which afterward became a cloth factory. The remains of the abbey church, partly early Norman and partly decorated English, may still be seen. It was the burial place of Athelstan and the birthplace of the philosopher Hobbes. The church of Garsdon, 2 miles distant, contains many memorials to the Washington family and the manor house of Sir Lawrence Washington (died 1643), now a farm. Pop., 1901, 2900; 1911, 2656. Consult *Registrum Malmesburiense*, edited by Brewer and Martin (London, 1879–81), and Perkins, *Malmesbury Abbey* (ib., 1901).

MALMESBURY, James Harris, first Earl of (1746–1820). An English diplomat, born at Salisbury, April 21, 1746, and educated at Winchester, Oxford, and Leyden. At the age of 21, through the influence of Lord Shelburne, he was appointed Secretary of the Embassy at Madrid. His skillful diplomacy there as chargé d'affaires at the time of the dispute between England and Spain in regard to the Falkland Islands led to his appointment in 1771 as Minister Resident at Berlin, where he remained four years. In 1777 he was made Ambassador to Russia. The state of his health compelled him to leave St. Petersburg in 1783, but next year he accepted from the Pitt ministry the post of Minister to The Hague. In 1788 he brought about an alliance of England with Holland and Prussia, which service gained for him the title of Baron Malmesbury. Returning to England, he entered Parliament, of which, in spite of his long absences, he had been a member since 1770. He was a Whig till 1793, when he became a supporter of the administration, and Pitt sent him to negotiate a treaty between England, Prussia, and Holland—a mission which he successfully discharged. In 1794 he arranged the marriage between the Prince of Wales and Caroline, daughter of the Duke of Brunswick. His fruitless negotiations for peace with the French Republic in 1796 at Paris and next year at Lille were his last missions, as he now deemed himself incapacitated by growing deafness from taking further part in public affairs, except as an adviser of the men of both parties, by whom, for several years, he was freely consulted. In 1800 he was made Earl of Malmesbury and Viscount Fitzharris. He died Nov. 21, 1820. Consult his *Diaries and Correspondence* (4 vols., London, 1845); *Lord Malmesbury and his Friends: Letters from 1745 to 1820* (ib., 1870), both edited by J. H. Harris, his grandson; *Lord Malmesbury's Embassy: Official Documents in the Negotiations at Lisle* (Edinburgh, 1797); W. E. Auckland, *Journal and Correspondence* (London, 1861–62); P. H. S. Stanhope, *Life of Pitt* (4 vols., ib., 1861).

MALMESBURY, James Howard Harris, third Earl of (1807–89). An English statesman. He was educated at Eton and at Oriel College, Oxford; was returned to Parliament as a Conservative in 1841, but succeeded his father in the peerage the same year. He became Secretary for Foreign Affairs in Lord Derby's first administration (1852). Lord Malmesbury occupied the same position in the second cabinet of Lord Derby (1858–59), when he endeavored to prevent the war between France and Sardinia and Austria. In 1866 he became Lord Keeper of the Privy Seal, remaining in office till 1868. From 1874 to 1876 he was again Privy Seal. He edited the *Diaries and Correspondence* of his grandfather (London, 1845) and *The First Lord Malmesbury and his Friends* (London, 1870). Consult *Memoirs of an Ex-Minister: An Autobiography* (London, 1884; 4th ed., 1885), and L. C. Sanders, in *Dictionary of National Biography*, vol. xxv (ib., 1891).

MALMESBURY, William of. An English chronicler. See William of Malmesbury.

MALMIGNATTE, măl′mė-nyăt′ (corruption of the Corsican name *marmignatto*). A spider of the genus *Latrodectus*, common in southern Europe, whose bite is much dreaded. See Spider; and cf. Tarantula.

MALMÖ, măl′mẽ. A seaport of Sweden, the capital of the Län of Malmöhus, and the third largest city in the country. It is situated on the Sound, opposite Copenhagen, with which it is connected by ferry (Map: Sweden, E 9). The old part of the city is entirely surrounded by canals, inside of which the old fortifications have been razed, and their sites converted into beautiful parks and boulevards. Among the most prominent buildings are the fine city hall, built in 1546 in the Dutch Renaissance style, the old Gothic church of St. Peter, begun in 1319, and the Governor's residence. The Malmöhus, an old fortified castle of the fifteenth century, is now used as a prison; in it Bothwell, husband of Mary, Queen of Scots, was imprisoned from 1567 to 1573. Malmö is an important industrial centre and has some of the largest ironworks and foundries in the country, besides manufactures of railroad and tram cars, textiles, shoes and gloves, tobacco, brandy, and chocolate. It is the terminus of eight railroad lines, has the largest artificial harbor in Scandinavia, and regular steamship connection with many foreign cities besides Swedish towns. There is a lively export trade in the agricultural products of the exceedingly fertile Province of Skåne, of which it is the capital, and the chief imports are coal and raw cotton. Its population has more than trebled since 1860, and in 1901 was 60,857 and in 1912, 92,338. Malmö is first mentioned in the early part of the twelfth century, when its name was Malmöghe, or Malmhauge, which means "sand bank." It was then a fishing village, but by the beginning of the sixteenth century it was, next to Copenhagen, the largest and most important city of the Danish possessions. During the wars of the following period it declined until the opening of its harbor in 1775, when its prosperity began to return. In 1658 it came into the possession of Sweden, together with the district of the Skåne. The present prosperity of the town dates from the construction of the harbor at the end of the eighteenth century and the opening of the railroad to Stockholm in 1856.

MALMSTRÖM, mälm′strẽm, BERNHARD ELIS (1816–65). A Swedish poet and author, born in the Province of Nerike. He studied at the University of Upsala and afterward became dean and professor of æsthetics and literature there (1856). His poetical works, though few in number, have placed him among the first of Swedish poets. They include: *Fiskarflickan på Tynnelsö* (1839) (The Fisherman's Daughter); *Angelika* (1840), an elegy, which won him the prize of the Swedish Academy; *Julianus* (1841); *Dikter* (1845–47; 9th ed., 1897). Among his prose writings are *Litteraturhistoriska Studier* (1860–61). His complete works were published posthumously, *Samlade Skrifter* (8 vols., 1866–69).

MALMSTRÖM, JOHAN AUGUST (1829–1901). A Swedish historical and genre painter and illustrator. He was born at Vestra Ny, East Gothland, and studied at the Stockholm Academy, Düsseldorf, Paris, where he became a pupil of Couture, and in Rome. After his return (1864) he was made professor at the Stockholm Academy (1867), and from 1887 to 1893 he was director. His subjects are chosen chiefly from Norse history and sagas. They are painted with romantic delicacy and a certain technical skill, especially as regards the treatment of light. Such are "King Heimar and Aslög"; "Sport of Elves"; "The Bråvalla Battle." In later years he also painted fresh and spirited genre pictures of child life. He illustrated *Fridthjof's Saga* (1868), *Fenrik Stål*, and other northern legends, and fairy tales of Asbjörnsen and Topelius.

MALO, mȧ′lō′, CHARLES ALBERT (1851–1912). A French military writer, born at Pin-le-Haras in Orne. He took part in the Franco-German War, receiving in 1870 the médaille militaire for his bravery at Metz. But he was made prisoner and spent the rest of the war in a German fortress. After his return to France he was on the staff of the War Department. In 1879 he became editor of the *Journal des Débats* and in 1885, in conjunction with Berger-Levrault, founded the *Revue de Cavalerie*, remaining chief editor until 1911. His most important works are the summaries or technical descriptions of campaigns that he contributed to Marquhardt's *Bibliothèque internationale d'histoire militaire*, among them *Campagne de 1805 en Allemagne et en Italie* (1886); *La guerre de 1866 en Allemagne et en Italie* (1886); *Campagnes de Gustave-Adolphe* (1887); *La situation militaire de la Belgique dans le cas d'une guerre franco-allemande* (1887); *Campagnes de Turenne* (1888); *L'Armée suisse en 1889* (1890); *M. de Moltke* (1891). Of his other works may be mentioned *Champs de bataille de l'armée française* (1900), treating of battlefields in Belgium, Germany, and Italy; and *Champs de bataille de France* (1900), referring to his own country; *Le Général Gallifet* (1910).

MALOLOS, mȧ-lō′lōs. The capital of the Province of Bulacán, Luzon, Philippines (Map: Philippine Islands, C 3). It is situated on an arm of the Pampanga Delta, 5 miles northwest of Bulacán Bay. It has a telegraph station and lies within a short distance of a station on the Manila Railroad, being a considerable trade centre. It was the first capital of the so-called Philippine Republic, proclaimed by the natives after the Spanish-American War, but was soon abandoned by the insurgent government. The chief product of the vicinity is rice. Pop., 1903, 12,575.

MALON, mȧ′lôɴ′, BENOÎT (1841–93). A French Socialist, born near Saint-Etienne in the Department of Loire. Because of his agitation on behalf of the International he had to leave France for some years. He returned in 1880 and later edited the *Revue Socialiste* until his death at Asnières, Sept. 13, 1893. Malon did not think the social question to be as simple as did the German Socialists, and believed that religion, ethics, and æsthetics would bear their part in solving the problems. He was a man of fine character and great influence. He wrote: *L'International, son histoire et ses principes* (1872); *Histoire du socialisme et des prolétaires* (1881–84); *Le socialisme réformiste* (1885); *Le socialisme intégral* (1890–91).

MALONE, mȧ-lōn′. A village and the county seat of Franklin Co., N. Y., 61 miles by rail east by north of Ogdensburg, on the Salmon River and on the Rutland and the New York Central and Hudson River railroads (Map: New York, F 1). It is the seat of Northern New York Institution for Deaf Mutes and has Franklin Academy, the Alice Hyde Memorial Hospital, and the school district library. The village controls extensive agricultural interests and is an important industrial centre, having railroad shops, tanneries, woolen, pulp and paper, and flour mills, shirt factory, foundries and machine shops, sash, door, and blind factories, etc. There are municipal water works. The government is administered by a mayor, annually elected, and a village council, chosen on a general ticket. Malone was settled about 1803. Pop., 1900, 5935; 1910, 6467.

MALONE, EDMUND (1741–1812). A British scholar and editor of Shakespeare, born in Dublin, Oct. 4, 1741, educated at Trinity College, Dublin, and called to the Irish bar (1767). In 1777 he settled in London and began a systematic study of Shakespeare. He soon gained admission to the best literary circles of the day. In 1778 he published his *Attempt to Ascertain the Order in which the Plays of Shakespeare were Written.* This work, the first of the kind, was so well done that it has withstood, in the main, the most recent application of verse tests. In 1780 Malone published two important volumes as supplementary to Johnson's edition of Shakespeare as revised by George Steevens. From 1789 through 1790 he assisted Boswell in revising his *Life of Johnson.* In 1790 appeared his edition of the dramatist in 10 volumes. At his death, April 25, 1812, he left material for a new edition, which was prepared by James Boswell, the younger. It appeared in 1821 in 21 volumes and is known as the Third Variorum. Though not very well arranged in parts, it still remains the best of all complete critical editions. Malone has been called dull; he was certainly laborious and painstaking. He also edited *The Critical and Miscellaneous Prose Works of Dryden,* containing a valuable introductory essay (4 vols., 1800); took part in the Chatterton controversy with *Cursory Observations on the Poems Attributed to Thomas Rowley* (1782); and exposed the Ireland forgeries (1796). Consult: *Life,* by James Prior (London, 1864); Leslie and Taylor, *Life of Sir Joshua Reynolds* (ib., 1865); and Boswell's *Life of Johnson,* edited by G. B. Hill (Oxford, 1887), passim.

MALONE, John (1854–1906). An American actor and writer, born in Westfield, Mass., but brought up on the Pacific coast. In 1880 he went upon the stage in San Francisco. He played with Edwin Booth (1886–87), Mrs. Langtry (1888), Tommaso Salvini (1889–90), Modjeska (1897), and Richard Mansfield. Later he devoted himself to the writing of criticism.

MALOO (mä′lo͞o) **CLIMBER.** An East Indian climbing plant. See Bauhinia.

MALON′IC ACID, $CH_2(COOH)_2$. A chemical compound of carbon, hydrogen, and oxygen first obtained in 1858 by Dessaignes. It is now usually prepared by boiling cyanoacetic acid, $CH_2(CN)\cdot COOH$ (see Malonic Ester), with dilute acids or alkalies. Malonic acid is a white crystalline substance that melts at 134° C. (about 273° F.). It is very soluble in water, alcohol, and ether. Owing to the fact that two carboxyl (COOH) groups are linked in its molecule to one carbon atom, malonic acid loses a molecule of carbon dioxide (CO_2) when heated above its melting point, especially when heated at 180° C. (356° F.), and is thus transformed into acetic acid, CH_3COOH. See Malonic Ester.

MALONIC ESTER, or Diethyl Malonate, $CH_2(COOC_2H_5)_2$. An important compound of carbon, hydrogen, and oxygen, used in the synthesis of a number of organic substances. It is usually obtained by heating cyanoacetic acid with sulphuric acid in alcoholic solution. When pure it forms a colorless liquid that boils at 198° C. (about 388° F.); at low temperatures it congeals to a white crystalline mass that melts at about $-50°$ C. ($-58°$ F.). Its importance in synthetic chemistry is due to the fact that one of the two hydrogen atoms of its CH_2 group can be readily replaced by sodium, yielding the compound $CHNa(COOC_2H_5)_2$, which reacts with halogen derivatives of the hydrocarbons, the product being malonic ester with one of the hydrogen atoms of the CH_2 group replaced by a hydrocarbon radicle; when this substituted malonic ester is hydrolyzed (transformed into its acid) and the resulting substituted malonic acid is heated to about 180° C. (356° F.), carbon dioxide is evolved, and there remains behind a substituted acetic acid.

MAL′ORY, or **MALLORE,** Sir Thomas (flourished 1470). Author of the *Morte d'Arthur.* Nothing certain about him is known beyond the meagre statements in the preface and the closing passage of his famous book. He was a knight, and his translation was completed in the ninth year of the reign of King Edward IV, i.e., in 1469 or 1470. According to Bale (*Scriptores,* 1548), he was a Welshman; and with Bale agree several recent Celtic scholars, asserting at least that his name is derived from the Welsh *Maelor.* With more probability G. L. Kittredge has identified him with a Warwickshire Thomas Malory, Knight, who died March 14, 1470. Malory placed the manuscript of the *Morte d'Arthur* in the hands of William Caxton, who divided it into books and chapters and printed it in 1485. The contents are briefly summarized in the colophon: "Thus endeth thys noble and joyous book entytled le morte Darthur/ Notwythstondyng it treateth of the byrth/ lyf/ and actes of the sayd kyng Arthur/ of his noble knyghtes of the rounde table/ theyr meruayllous enquestes and aduentures/ th' achyeuyng of the sangreal/ & in thende the dolorous deth & departyng out of thys world of them al." The book was intended as a compendium of the various romances that had attached themselves to the legend of King Arthur. Here are the great stories of Lancelot and Guinevere, of Tristram and Iseult, and of most of the knights and ladies as known to the reader of Tennyson's *Idylls of the King.* Caxton expressly states that Malory reduced his book into English out of certain French books. So far as is known, these sources were the prose Merlin, the prose Lancelot, and the prose Tristan (thirteenth century), which in turn were expansions of Geoffrey of Monmouth, *History of the British Kings* (Latin prose), and the verse tales of Chrestien de Troyes and other French romancers (second half of twelfth century). Malory also made use of a fine English poem, known as the *Morte Arthur* (fourteenth century). Malory's compendium is necessarily loose in structure; but the career of King Arthur gives it a certain unity. It enjoys the distinction of being the first notable English prose romance.

The *Morte d'Arthur* was well received from the first. Caxton's edition in black letter was followed by six similar editions down to 1634. The work was not again reprinted till 1816, when two editions appeared. It is now accessible in the editions of Thomas Wright (London, 1856; new ed., 1897), Edward Strachey (modernized in spelling, Globe ed., ib., 1868; often reprinted), Ernest Rhys (ib., 1909), and Oskar Sommer (ib., 1889–91). The last, a reprint of the first edition, contains an exhaustive study by Sommer on the sources, and an essay by Andrew Lang on the style. The most popular modern editions are the Temple Classics, edited by Israel Gollancz (London, 1897 et seq.), and Everyman's Library, edited by Ernest Rhys (ib., 1908). Consult also: Jusserand, *Le roman au temps de Shakespeare* (Paris, 1888); C. S. Baldwin, *Inflections and Syntax* (Boston, 1894); G. L. Kittredge, "Who was Sir Thomas Malory?" in *Harvard Studies and Notes,* vol. v (Cambridge, Mass., 1896); *Selections,* edited by Mead (Boston, 1897); *Boy's King Arthur,* edited by Sidney Lanier (New York, 1908). See Arthur; Grail, The Holy; Lancelot; Merlin; Tristram; Geoffrey of Monmouth.

MALOT, mȧ′lō′, Hector (1830–1907). A popular French novelist, born near Rouen. Though educated for the law he turned to letters, served an apprenticeship on Didot's *Dictionnaire* *biographique* and the popular *Journal pour Tous*, did some dramatic collaboration of no present significance, and in 1859 produced his first novel, *Victimes d'amour*, a book of more promise than was afterward realized. In some 65 volumes he dealt with the society of the Second Empire, showing a tendency to sensationalism, a power of graceful description, and a very winning sympathy for child life that made his *Sans famille* (*No Relations*, 1878; translated and republished in America) a cosmopolitan success. Other noteworthy works are: *Un beau-frère* (1869); *Romain Kalbris* (1869); *Baccara* (1886); *Conscience* (1888); *Justice* (1889); *Complices* (1893); *En famille* (1893); *Amours de jeune, amours de vieux* (1896). In 1897 he wrote *Le roman de mes romans*. This was a literary biography and his last work.

MALPIGHI, mȧl-pē′gē̇, MARCELLO (1628–94). A celebrated Italian anatomist, born at Crevalcore, near Bologna. He studied medicine at Bologna under Massari and Mariano, took his doctor's degree in 1653, and was appointed professor at Bologna by the Senate three years later. Shortly after this he went to Pisa, where, in association with Borelli, he made numerous dissections of animals and ascertained that the muscle fibres of the heart are of a spiral form. The climate of Pisa proving unfavorable, Malpighi removed to Bologna in 1659, where he remained three years and became very popular. In 1662 he succeeded Peter Castelli at Messina. In 1691 the new Pope, Innocent XII, called him to Rome as his physician, and three years later he died of apoplexy, at the age of 66.

Malpighi lived at a time when nature began to be studied rather than books. He was an original and profound observer, a man of great industry, acute intelligence, and natural aptitude for research. His investigations covered a wide range of subjects, and many of his conclusions are undisputed at the present day. He is most widely known for his efforts to place human physiology on a true basis, but his discoveries in entomology and botany were no less epoch-making. His *Observationes Anatomicæ* (Bologna, 1661) contained the first published researches into the structure of the lungs with the microscope. *Epistolæ Anatomicæ* (Bologna, 1661–65) record the discovery of the *rete Malpighii*, one of the layers of the skin. His observations on the structure of the viscera and his investigations in embryology and vegetable histology, as well as his determination of the structure of glands, were equally important.

MALPIGHIA, măl-pē′gĭ-ȧ. A tropical fruit. See BARBADOS CHERRY.

MALPLAQUET, mȧl′plȧ′kȧ′. A village in the Department of Nord, France, 21 miles east of Valenciennes, and close to the Belgian frontier, celebrated for the bloody defeat of the French, under Marshal Villars, in the War of the Spanish Succession, by the troops of the Grand Alliance, under Marlborough and Prince Eugene, Sept. 11, 1709. The forces engaged consisted of more than 200,000 men, the allies having a slight superiority in numbers, but the French had the better position. The allies lost in the battle at least 20,000 men; the French not more than 15,000. The result of the conflict was the capture of Mons and Douai. See SUCCESSION WARS.

MALPRAC′TICE. In law, bad professional treatment, as of disease, pregnancy, or bodily injury, resulting from ignorance, carelessness, or done with criminal intent. In offering his services to the public the doctor or surgeon impliedly contracts that he possesses and will employ reasonable skill and learning, will exercise reasonable and proper care, and exert his best judgment to effect good results. This obligation rests on any person making a pretense of professional knowledge. Failure to do this renders him liable for resultant injuries to the patient, criminally or by civil suit, according to the degree of his negligence and fault.

Criminal liability arises from gross negligence or from incompetency. Where the results of a physician's fault are not so serious as to constitute an offense against the public and render him liable criminally, he may still be obliged to make compensation to the patient for the damages resulting from his wrongful acts through an action at law. But a physician is not an insurer, and in the absence of express agreement he does not warrant a cure, nor is the test to be applied to his performance that of the highest order of skill and care obtainable, but that of the average of members of his profession in good standing in similar localities, considering the state of medical science of the time. Thus the requirement in knowledge or skill imposed upon the frontier surgeon is not that of the attending physician of a great city hospital. His responsibility before the law is not fixed by the recognition of the tests of any particular school, homœopathic, allopathic, or empirical. What is reasonable care must be determined by the particular case, though the same degree must be rendered to the poor of the charity hospital as to the millionaire's child. This obligation to use proper diligence, care, and skill includes not only diagnosis and the employment of such obtainable remedies and appliances as discovery and experience have proved most beneficial, but also the giving of proper instructions to patients and nurses and freedom from error in writing.

On undertaking a case the law implies a contract that the physician continue his attendance while treatment is required, unless terminated by discharge by the patient or his withdrawal from the case on proper notice. When he informs a patient that his disease or injury is curable when he knows it to be incurable or is ignorant as to the truth of his representation, and the patient is induced to undergo his treatment thereby, he is liable in an action for deceit. Such misrepresentation will also be a defense to a suit on his part to recover his fees. Where a practitioner possesses the requisite qualifications and applies his skill and judgment with ordinary diligence he will not be held responsible for an honest mistake or error of judgment in diagnosis or treatment where there is reasonable doubt as to the course to be followed.

Malpractice by a lawyer is evil practice in a professional capacity and the resort to methods and practices unsanctioned and prohibited by law. Consult the authorities referred to under TORT.

MALSTATT-BURBACH, mȧl′shtȧt-bṳr′bäG. A town in the Rhine Province, Prussia, on the Saar, opposite Saarbrücken. It has extensive iron and steel works, one institution employing 4200 men, manufactures of Portland cement, machinery, railway carriages, boilers, safes, bricks, and phosphate, and is the centre of a large coal-mining district. It has considerable export trade by river in coal, ore, and limestone. Pop., 1900, 31,200; 1905, 38,554. Malstatt-Burbach was made a city in 1875, when Malstatt and Burbach were consolidated.

MALSTRÖM, mȧl-strēm′ (from Norw. *malstraum*, from *mala*, to grind + *straum*, stream), or MAELSTROM. A rapid tidal eddy or current running between Vaerö and Moskenaesö, two of the Lofoten (q.v.) Islands, lying near the southwest end of the group (Map: Norway, E 3). It has been made famous by the exaggerated accounts of older writers on Norway. Owing to the great difference in tide level in the West Fiord, between Lofoten and the mainland and the ocean, the vast mass of water, which every 12 hours must be moved from the fiord into the ocean and back again, has to run very swiftly through the narrow channels between the islands, causing in several places dangerous currents. The swiftest of these is the Moskōström, which is rendered still more dangerous by the eddies (*malströmme*) caused by sudden differences in the depth of the channel. When the current flows fastest, between high and low tide, and the wind blows directly against it, the sea for miles around becomes so violently agitated that small vessels cannot live in it.

MALT. See BARLEY; BEER; BREWING.

MALTA, mạl′tȧ. A British island colony in the Mediterranean Sea, consisting of the island of Malta (in lat. 35° 53′ N. and long. 14° 31′ E.), the neighboring islands of Gozo and Comino, and the islets Filfla and Cominotto. The distance to the nearest point of Sicily is about 58 miles and Africa about 180 miles (Map: Italy, E 7). The total area of the colony is about 118 square miles. The island of Malta is about 17 miles long and 9 miles broad, with an area of 91.6 square miles; Gozo has an area of 25.8 square miles, Comino about 1 square mile. The surface of the island of Malta is comparatively low, the highest point not exceeding 845 feet. The climate is mild and healthful for most of the year, but in summer it is hot and during August and September the sirocco prevails. The mean temperature is 64.6° F. and the mean annual rainfall 20 inches. There are no streams, the water being absorbed in the porous sandstone beds. The soil is exceedingly fertile and highly cultivated, producing two and sometimes three crops annually. The products include potatoes, corn, oranges, figs, onions, grapes, cummin seed, and honey. There are quarries of marble, alabaster, and building stone. Among the manufactures are cotton goods, filigree, lace, and matches. Many of the inhabitants are employed in connection with the trade of Valletta (the capital) as a coaling station, port of call, and entrepôt. Imports and exports of merchandise in the fiscal year 1912 were valued at £2,413,687 and £750,422 respectively; in 1913, £2,614,566 and £977,656 (in 1913, £1,129,799 from and £45,895 to the United Kingdom). The total net tonnage, exclusive of the coasting trade, entered and cleared at Valletta increased from 7,566,763 (4,981,204 British) in the fiscal year 1908 to 10,398,948 (5,510,556) in 1913. Valletta is a port of registry and had Jan. 1, 1913, 99 vessels of 4121 tons gross. There are a metre-gauge government railway of 7¾ miles; telephone, 780 miles of wire; direct cables to Alexandria (3), Gibraltar (3), Bône (2), Messina (1), Tripoli (1), Sicily (1), Zante (1). Malta, notwithstanding its small size, is of great importance to the United Kingdom on account of its strategic position in the Mediterranean. Valletta is a strongly fortified naval station on an excellent harbor. A new breakwater was constructed there in 1909.

The government is administered by a governor advised and assisted by an executive council, established in 1881, reconstituted in 1887 and again in 1903 and 1909. The council now (1914) consists of 11 official and two unofficial members besides the president. Legislation is effected by a partly elective council of government, originally constituted in 1849 and reconstituted in 1887 and 1903. It consists of 10 official members and eight elected, besides the president and vice president. The Governor is president of both councils. The colony has no direct taxation. The most important sources of revenue are customs, stamp duty, port dues, and rents. In the fiscal year 1908 revenue and expenditure were £438,348 and £445,669 respectively; in 1913, £442,035 and £427,581. Public debt, £79,081.

The people of Malta are mostly of the Mediterranean race. Many resemble the southern Italians, while some show distinct traces of Punic descent. They are industrious and thrifty. Many Maltese may be found in Algeria, Tunis, Egypt, and Gibraltar. The Maltese language, which is generally spoken, is supposed to be derived from the Carthaginian and Arabic; about 70 per cent of its vocabulary is Semitic, but the grammatical structure is derived from the Latin. The educated and commercial classes speak also Italian and English. Italian is the official language of the courts, but parents may decide whether their children shall learn Italian or English at school, and in 1912–13 over 98 per cent chose the latter. There are 172 public elementary schools, with about 21,200 pupils enrolled in 1912; two secondary schools (about 220 students), a lyceum (550), a university (165), and several other educational institutions; in addition there are about 70 private schools, with over 4000 pupils. The religion of the people is Roman Catholicism. The population in 1829 was 114,236; in 1873, 145,605. The 1901 census returned a civil population of 184,742; 1911, 213,395; 1913 (estimate), 216,617. The population, including British troops and their families present, was 228,534 in 1911. The chief town, Valletta, had with its suburbs (Floriana, Sliema, and St. Julian's) 44,143 inhabitants in 1911; "Three Cities" (Senglea, Cospicua, and Vittoriosa), 26,551; Città Vecchia, the old capital, in the interior of the island, 8896 (with suburbs); Victoria, the chief town of Gozo, about 5660. Birth rate (1912–13), 32.20; death rate, 19.79.

Malta has been identified with the Hyperion or Ogygia of Homer, the island on which Calypso (q.v.), the daughter of Atlas, who enslaved Odysseus, dwelt in a grotto. Two grottoes on Malta bearing her name are rivals as the traditional haunt of the nymph. At a very early date Malta was colonized by the Phœnicians. There are numerous remains of a still earlier people, whose culture is that of a race which once controlled the whole western part of the Mediterranean; this race too, it has been thought, came from Africa. The remains of this race consist of megalithic monuments of the neolithic period. Relics of the Phœnicians are seen in ruins of tombs, towers, houses, and cisterns. Malta had developed considerable commercial importance when about 736 B.C. the Greeks dispossessed the Phœnicians and named the island Melita. The Greeks in turn were displaced by the Carthaginians about 500 to 480 B.C. During the first Punic War Atilius Regulus, commanding a Roman fleet, ravaged the island, and in 218 B.C., during the Second Punic War, it was surrendered to Titus Sempronius by the Carthaginian commander Hamilcar, and became politically attached to Sicily. The Romans made the island a *municipium* and allowed the Carthaginian inhabitants to remain. Under the Romans, as is clear from remains of Roman houses and palaces, the island long flourished greatly. There are remains of a theatre, temples, and other buildings erected by the Romans, to whom Malta became well known for its textiles. In 61 A.D. St. Paul was shipwrecked on the north coast (see Acts xxvii and xxviii); St. Paul's Bay, in which, on the island of Selmun, is a colossal statue of the Apostle, is pointed out as the generally accepted landing place. On the dissolution of the Roman power Malta was occupied successively by Vandals in 454, by Goths in 464, and again by the Greeks under Belisarius in 533. At their third attempt during the ninth century, with the assistance of the natives who massacred the Byzantine garrison, the Arabs became the masters and fortified the harbor as a station for their corsairs in 870. They were not driven out until 1090 by the Normans under Count Roger, who established a popular form of government which, with certain modifications, lasted for 700 years. Again it became politically attached to Sicily until 1530, when Emperor Charles V granted it with Gozo and Tripoli in perpetuity to the Knights of the Order of St. John of Jerusalem, after the Turks had captured their great stronghold at Rhodes. Taking the title of the Knights of Malta, they built immense fortifications and rendered invaluable services to Christendom in checking and chastising the Barbary pirates and in defending the island against the incessant attacks of the Turks. The most formidable of these was the siege in 1565 by the Sultan Solyman II, when the Knights, commanded by the heroic La Valette forced the enemy at the end of three months to retire with an immense loss of men. Valletta was then built and the fortifications were increased. A continual war on the Moslems was waged until 1798, when, disorganized by internecine quarrels, the Knights surrendered their fortresses to Bonaparte on his way to Egypt. Three months later, however, the Maltese revolted against the French and, assisted by Neapolitan, Portuguese, and British auxiliaries, after a siege and blockade of two years, forced the French garrison to capitulate. The inhabitants claimed the protection of England, and the status of Malta as a British dependency dates from its recognition as such by the Treaty of Paris in 1814.

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MALTA, Ancient and Illustrious Order of Knights of. A fraternal and beneficial order, incorporated in America as a fraternal beneficial order in 1889. The order was composed in 1913 of one supreme commandery, which is the executive branch, five grand commanderies, and 276 subordinate commanderies, which represent a total membership in America of about 32,000.

MALTA, Knights of. See Saint John of Jerusalem, Knights of.

MALTA FEVER, or Mediterranean Fever, Rock Fever, Neapolitan Fever, Undulant Fever, etc. A disease caused by the *Micrococcus melitensis* (discovered by Col. David Bruce in 1887) and characterized by fever, profuse perspiration, constipation, pain, and swelling in joints, enlargement of the spleen, and frequent relapses. Bruce believes the infection is conveyed from the sick to the healthy by way of the alimentary canal, i.e., through contaminated food or drink, goats' milk being the medium in most cases. This affection has a wide distribution along the Mediterranean coasts. Cold sponging, antipyrine, hypnotics, the application of iodine to the painful joints, aperients, and a diet of milk and broth form the treatment desirable, with a change of climate as soon as the patient is fit to move with comfort. In 1903 Malta fever appeared in Texas, in a soldier from the Philippines, making about 12 cases in the United States, all imported. Other cases have been reported in the Mississippi valley and in the Southwest (Arizona and New Mexico), where mohair goats are extensively raised. The disease has a mortality rate of only about 3 per cent.

MALTASE, mạl′tās. See Digestion in Plants; Enzyme.

MALTE-BRUN, mäl′te-bro͞on′, *Fr. pron.* målt′brēN′, Konrad, properly Malte Bruun (1775–1826). A Danish geographer, born at Thisted, Jutland. He studied in Copenhagen and, because of sympathy with the French Revolution and bitter pamphleteering against the government, was in 1800 condemned to perpetual banishment. He sought refuge in Sweden and then in Paris, where he maintained himself by teaching and literary labors. In 1808 he began the *Annales des voyages, de la géographie et de l'histoire* (24 vols.), which he concluded in 1814, and in 1818 began, with Eyriès, the *Nouvelles annales des voyages.* For some time he was joint editor of the *Journal des Débats,* but is principally known for his geographical works, chief of which is the *Précis de la géographie universelle,* completed by Huot, eight volumes, with an atlas (Paris, 1810–29; 6th ed., 1853; new ed., 1872). He took part also in the preparation of the *Dictionnaire de la géographie universelle* (Paris, 1821 et seq.), and was secretary to the Geographical Society of Paris.—His son, Victor Adolphe (1816–89), was one of the eminent geographers of France, taught at various institutions, and succeeded his father as secretary of the Geographical Society of Paris. He published *La France illustrée* (3 vols., 1857; new ed., 1895–97), *Géographie universelle* (1874), *L'Allemagne illustrée* (1884–85), etc.

MALTEN, mäl′ten, Therese (1855–). The stage name of a noted German dramatic soprano, Therese Müller, born at Insterburg.

She studied with Gustav Engel in Berlin and made her début in 1873 in Dresden as Pamina in *The Magic Flute.* From that time on till her retirement in 1903 she remained a member of the Dresden Opera, with frequent leaves of absence for appearances in the principal European opera houses. In 1882 Wagner conferred upon her the honor of selecting her as the original Kundry in *Parsifal.* Her repertory included all the great operas, but she was preëminent as an interpreter of Wagner's heroines.

MALTESE, ma̤l-tēz′ *or* ma̤l-tēs′. The name of a breed (1) of cats and (2) of lap dogs. The Maltese or blue cat is so called on account of its uniform bluish-gray color. (See Cat, *Domestic Cat.*) The dog is supposed to have originated in Malta.

MALTESE CROSS. A cross of eight points, of the form worn as a decoration by the Hospitalers and other orders of knighthood. See illustrations to Heraldry.

MAL′THA (Lat., from Gk. *μάλθα*, mixture of wax and pitch for calking ships). A name originally applied to a mineral fat from Kirwan, resembling wax and probably composed of paraffin. The name is now applied to the semisolid or viscous varieties of bitumen. It is of black color, with a specific gravity of 1 or a little less. Mineral tar is a popular name for it. Maltha resembles petroleum in composition, but differs from it in containing a smaller percentage of the lighter oils. Indeed, it may at times have been formed by the oxidation and evaporation of petroleum on exposure to the air. In the United States it is found in California, where it oozes from the rocks in certain localities, but the quantity available is not large. See Bitumen; Asphalt.

MALTHUS, măl′thŭs, Thomas Robert (1766–1834). An English economist. He was educated by private tutors at his home, at a small academy at Warrington, and at Cambridge, where he received the degree of B.A. in 1788. The following years he devoted to the study of physical science, with, however, a growing interest in social problems. In 1791 he received the degree of M.A. and in 1793 a fellowship in his college, and took a curacy near Albury. The publication of William Godwin's *Enquirer*, which argued for a reconstruction of society on a basis of equal distribution of goods, inspired Malthus to a study of population, the fruit of which was the *Essay on the Principle of Population as it Affects the Future Improvement of Society* (1798), which was published anonymously. The main thesis of this work was that population in all times has tended to outrun subsistence. The means of subsistence, Malthus argued, might increase in arithmetical progression, but population tended to increase in a geometrical ratio. Accordingly there could be no permanent amelioration of the lot of the lower classes; a redistribution of wealth might bring them plenty for a time, but population would soon overtake subsistence, and would as before be kept in check by starvation or vice, unless checked by self-restraint. In 1803 a second edition of the *Essay on Population* appeared. In this edition Malthus defends his proposition by a wealth of data relating to civilized, barbarous, and savage peoples. Here as in later editions he is more disposed to dwell upon the necessity of moral restraint as a preventive of overpopulation and less inclined to regard vice and misery as the fate of the human mass.

The importance of this work for economic thought can hardly be overestimated. Before the publication of the *Essay on Population* it was held even by statesmen like Pitt that increase in population is always an unqualified advantage for a state. The arguments of Malthus quickly dispelled this belief and served to direct public sentiment against a poor law that was rapidly filling England with paupers. In economic science the "Malthusian doctrine" has played an important part in every theory of wages propounded since its enunciation; and in a widely different department of thought—biology—the work of Malthus has the distinction of having suggested to Darwin the influence of the struggle for survival upon progress.

In 1805 Malthus was appointed professor of political economy at the East India Company's College at Haileybury. He entered upon his duties there in 1807 and occupied that position until his death. Of his other works, the *Nature and Progress of Rent* ranks high among the original contributions to political economy. In this essay the "law of diminishing returns," afterward identified with the name of Ricardo, is stated with great clearness. Little of importance was added by his *Political Economy* (1820) and by his numerous economic pamphlets.

No economic writer has been more harshly criticized than Malthus. "Malthusianism" still designates an attitude of hard-hearted indifference to the sufferings of the poor. Because of the extravagance of some of his followers, the Neo-Malthusians, who sought to popularize artificial methods of checking the growth of population, Malthus has frequently been denounced as an exponent of immorality. His *Essay on Population* has received numberless "refutations," but scientific economists are agreed that when divested of its too absolute form of expression, the doctrine of Malthus enunciates an indisputable truth, which cannot be ignored with impunity by any plan of social amelioration or reform. See Political Economy.

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MALTING. See Brewing.

MALTOBIOSE. See Sugars.

MALTON, ma̤l′ton. A market town in the North Riding of Yorkshire, England, on an elevation on the Derwent, 21 miles northeast of York (Map: England, F 2). It has foundries, agricultural implement works, and large stables and training schools for race horses. It has a grammar school, founded in 1545, and the remains of a priory, founded in 1150. Pop., 1901, 4758; 1911, 4822. Malton, called by the Romans *Camulodunum*, was an important Roman military station. The town was burned and rebuilt in the reign of Stephen, after which it was generally called New Malton. About 4 miles from Malton is Castle Howard, a famous building by Vanbrugh, standing in its own park.

It is the seat of the earls of Carlisle and contains a fine chapel and a renowned collection of paintings.

MALTOSE. See SUGARS.

MALT SPROUTS (AS. *mealt*, OHG. *malz*, Ger. *Malz*, from AS. *meltan*, *miltan*, to melt; connected with Gk. *μέλδειν*, *meldein*, to liquefy, OChurch Slav. *mlŭdŭ*, soft, and ultimately with OHG. *smelzan*, Ger. *schmelzen*, Eng. *smelt*). The sprouts or radicles of germinated grain, separated before the malt is used, and also the exhausted grain residue; a by-product from breweries, resulting in the preparation of malt from barley. The barley is sprouted to develop the principle of malt in the grain, and when the process has proceeded far enough it is checked and the sprouts are broken off. The sprouts and the brewers' grain are fed to cattle and parts of the refuse are sometimes used as fertilizers. The average percentage composition of malt sprouts is: water, 10.2; ash, 5.7; protein, 26.2; fibre, 11.7; nitrogen-free extract, 44.5; and fat, 1.7 per cent. See BREWING.

MALTZAN, mäl'tsȧn, HEINRICH, BARON (1826–74). A German traveler and ethnologist, born in Dresden. He studied law at Heidelberg, traveled in the East for his health, and familiarized himself with the habits and languages of the inhabitants of Algeria, where he lived for several years. He traveled to Abyssinia in 1857 and made a ceremonial pilgrimage to Mecca in 1860, but barely escaped with his life when he attempted to get to Medina. He then returned to the northern coast of Africa, where he made researches in Tunis and Tripoli (1867–69). He wrote: *Drei Jahre im Nordwesten von Afrika* (1863); *Meine Wallfahrt nach Mekka* (1865); *Reise auf der Insel Sardinien* (1869); *Reise in Tunis und Tripoli* (1870); and *Reisen in Arabien* (1873). He committed suicide in 1874.

MA'LUM IN SE AND **MALUM PROHIB'ITUM.** *Malum in se* (Lat., evil in itself) is a term which is applied to crimes which involve moral turpitude or wrong in their very nature, such as murder or theft. *Malum prohibitum* (Lat., prohibited wrong) is applied to offenses which are not morally wrong in their nature, but are prohibited by statute and therefore unlawful. The distinction is useful in determining proper measures of punishment. Any person may be presumed to have a moral sense of right and wrong, but may nevertheless ignorantly and unintentionally violate some statute or ordinance which does not involve moral transgression. See CRIME.

MALUS, mȧ'lụs', ETIENNE LOUIS (1775–1812). A French military engineer and physicist, born at Paris and educated at the Ecole Polytechnique. He served in the Army of the Rhine, was attached to the Egyptian expedition, was present at the siege of Cairo, and came back to France in 1801. He then took charge of the fortifications at Antwerp and Strassburg, at the same time carrying on his scientific researches. His *Traité d'optique*, published in 1811, treats of the refraction and reflection of light and contains experiments in regard to the reflection of light by transparent media. Malus in the course of his experiments discovered that the phenomenon known as the polarization of light would be produced by reflection. As he believed in the emission theory, he advanced the hypothesis that particles of light have poles and that on entering a doubly refracting crystal some of the particles forming one of the rays may be so arranged as to be transmitted through it, while the particles which should have formed the other ray may be so arranged as to prevent their transmission in certain directions. (See LIGHT.) Malus published an account of his experiments in the *Memoirs* of the Institute, which at once elected him to its membership; and the English Royal Society gave him the Rumford medal, though France and England were then at war. In 1810 he published his *Théorie de la double réfraction de la lumière dans les substances cristallisées*, which was crowned by the Institute.

MALVA'CEÆ (Neo-Lat. nom. pl., from Lat. *malva*, mallow). A family of plants including about 45 genera and 900 species, widely distributed in temperate and tropical regions. They are herbs or shrubs, sometimes becoming trees in the tropics. The family is characterized by its alternate, mostly palmately veined leaves, its regular and often large flowers, but chiefly by its monadelphous stamens, which form a central column around the pistil and are inserted with the base of the petals. The conspicuous useful plant of the family is cotton (*Gossypium*, q.v.). Other well-known genera are *Althæa* (including marsh mallow and hollyhock), *Malva* (mallow), *Sida*, *Abutilon* (Indian mallow or velvet leaf), and *Hibiscus* (including rose mallow, the shrubby althæa of gardens, and okra or gumbo).

MALVERN, măl'vẽrn. A city and the county seat of Hot Spring Co., Ark., 21 miles southeast of Hot Springs, on the Chicago, Rock Island, and Pacific and the St. Louis, Iron Mountain, and Southern railroads (Map: Arkansas, C 3). It is surrounded by a cotton, timber, and fruit-growing district and has four large lumber mills and manufactures of doors, windows, chairs, ice, and bricks. Pop., 1900, 1582; 1910, 2778.

MALVERN, mạl'vẽrn *or* mạ'vẽrn, GREAT. A town and inland watering place in Worcestershire, England, picturesquely situated on the east side of the Malvern Hills, 8 miles southwest of Worcester (Map: England, D 4). Its mean annual death rate is less than that of any other watering place in the Kingdom, owing to the purity and abundance of the spring water and the remarkable salubrity of the climate. It has chalybeate, saline, and alkaline springs and is a great summer resort. Its restored eleventh-century priory church is famous. Malvern is a great educational centre, the most prominent school being Malvern College (1865), a public school for boys. Near by are the villages of Malvern Link, Malvern Wells, Little Malvern, and West Malvern, all of them consisting of villas, hotels, and hydropathic establishments. Pop., 1901, 16,400; 1911, 16,513.

MALVERN HILL, BATTLE OF. A battle fought on July 1, 1862, at Malvern Hill, Va., near the north bank of the James River, about 15 miles southeast of Richmond, between the Federal Army of the Potomac, numbering about 80,000 men, under General McClellan, and the Confederate Army of Northern Virginia, also numbering about 80,000, under General Lee. It was the last of the "Seven Days' Battles" (q.v.) in the Peninsular campaign. After the engagements at White Oak Swamp and Glendale on June 30 the whole of the Federal army was stationed on Malvern Hill, an eminence about 60 feet in height, by nature a position of great strength. Gen. Fitz John Porter was in immediate command, General McClellan having absented himself to confer with Commodore Rodgers on the gunboat *Galena.* Late in the afternoon of the 1st the Confederates, under the immediate command of Generals D. H. Hill, Huger, and Magruder, advanced against the position, though there had been an almost continual artillery fire throughout the morning; and the fighting continued with slight intermission until nine o'clock in the evening, when the Confederates, having sustained heavy losses, finally withdrew without making any impression on the Federal lines. The Federal artillery, which proved exceedingly effective throughout the battle, and was so posted that the fire of 60 guns could be concentrated on any point, was under the general direction of Colonel Hunt. During the battle also a fire from the gunboats in the rear of the Federals did some execution in the Confederate ranks. The exact losses of the two armies at Malvern Hill were never accurately determined, but it is estimated that the Confederates lost more than 5000 in killed and wounded and the Federals about one-third of that number.

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MALVOISIE (măl′vwȧ-zē) **WINE.** See Wine.

MALVOISIN, mȧl′vȯ-zĭn, or **MAWMOISINE,** mą′moi-zĭn, William (?–1238). A Scottish ecclesiastic. He was born in Normandy and educated in France. Going to Scotland, he was made one of the *clerici regis* and archdeacon of St. Andrews. In 1199 he was constituted Chancellor of Scotland, in 1200 Bishop of Glasgow, in 1202 of St. Andrews; in 1211 he resigned his chancellorship; in 1212 by appointment of the Pope he convoked at Perth a great council of the clergy and people to press upon the nation the Pope's will and command that an expedition be undertaken to Palestine, but the nobles received the proposition coldly. In 1214 he attended the coronation of King Alexander II and is said to have placed the crown on his head. The following year he went with the bishops of Glasgow and Moray to Rome to attend the fourth Lateran Council, remaining abroad until 1218. On his return he effected the deliverance of Scotland from the papal ban. He brought from the Continent various orders of monks and mendicants before unknown in Scotland, and established convents of black friars at several places. He died in Inchmurtach, near St. Andrews, July 5, 1238.

MALVO′LIO. In Shakespeare's *Twelfth Night*, steward to Olivia.

MÄLZEL, mĕl′tsel, Johann Nepomuk (1772–1838). A German inventor of musical mechanisms, born at Ratisbon. At first a music teacher, he soon became famous for his inventions, among them a sort of orchestrion, a mechanical chess player, and an automatic trumpeter. In 1808 he was made court mechanician at Vienna. He constructed a number of ear trumpets, one of which was used by Beethoven. He was credited with having invented, in 1816, the metronome (q.v.), but in this he was anticipated, probably by Winkel of Amsterdam. He died while en route for the United States.

MAM, mäm. One of the principal Mayan tribes of Guatemala. The Mam are located chiefly in the western part of the Republic, but extend likewise into the adjacent districts of Chiapas, Mexico. The name signifies "ancestral," in allusion to the archaic forms of the language.

MAMÆ′A, Julia (?–235 a.d.). A Roman lady, mother of the Emperor Alexander Severus. A niece of Septimius Severus, she was born in Emesa, Syria. She was a woman of high principle, and educated her son so well that he was a model of all virtues save generosity. Mamæa's greed and parsimony roused to revolt the soldiers, who killed her and her son. Ulpian was one of her advisers, and tradition makes her not unfriendly towards the Christians.

MAMÁNUA, mȧ-mä′nōō-ä. A Negrito people in northeastern Mindanao. See Philippine Islands; Negrito.

MAMARONECK, mȧ-măr′ȯ-nĕk. A town, including the village of Larchmont and part of Mamaroneck village, in Westchester Co., N. Y., on Long Island Sound, 21 miles northeast of Grand Central Station, New York City, on the New York, New Haven, and Hartford Railroad (Map: New York, B 2). It is popular as a suburb of New York City and as a summer resort, with good bathing and fishing facilities. It has many handsome residences. Larchmont village contains the well-known Larchmont Yacht Club, and was once the home of J. Fenimore Cooper. There are manufactures of raincoats and rubber goods and a pumice-stone mill. Pop., 1900, 3849; 1910, 5699; Larchmont, 1910, 1958. Mamaroneck was purchased from the Indians on Sept. 23, 1661, by John Richbell. The name (from the Indian) means "where the fresh water met the salt."

MAMBÁJAO, mȧm-bä′hou. A town of the Province of Misamis, Philippines, situated on the northeast coast of Camiguín Island, off the north coast of Mindanao (Map: Philippine Islands, E 6). The shore here is very rugged. Pop., 1903, 14,446.

MAM′BER. The common wild goat of southwestern Asia and Asia Minor. See Goat.

MAMBRES, măm′brēz. See Jannes.

MAMBRINO, mȧm-brē′nȯ. A pagan king of Bithynia, mentioned in old Italian versions of the Charlemagne epic and further described in Ariosto's *Orlando furioso*, in which Mambrino is killed by Rinaldo. He wore a helmet of gold, which had the power of making the wearer invisible. This helmet figures in *Don Quixote*, whose hero, on seeing a barber wear a brass basin as a hat, declared it to be the magic helmet and wore it as such.

MAMBÚSAO, mȧm-bōō′sou. A town of Panay, Philippines, in the Province of Cápiz, situated on the river Malinannang, 17 miles southwest of Cápiz (Map: Philippine Islands, D 5). Pop., 1903, 8225.

MAMELI, mȧ-mā′lė, Goffredo (1827–49). An Italian poet and patriot, born at Genoa, son of Admiral Giorgio Mameli. He wrote a tragedy founded on Genoese history, when but 16 years old, and his verses, *L'Alba* and *Fratelli d'Italia*, became the campaign songs of 1848. He served under Garibaldi as aid-de-camp and in the defense of Rome (1849) was fatally wounded. Mazzini wrote an introduction to the edition of his poems published at Genoa in 1850. The best edition is that of Tortona (1859).

MAMELUCO, mä′mȧ-lōō′kȯ. The name given in central Brazil to the half-breed offspring of whites or negroes and Indians. It evidently has reference to the Mamelukes. See GUARANÍ.

MAMELUKES, măm′ĕ-lūks (from Fr. *mameluk, mamaluc*, from Ar. *mamlūk*, purchased slave, from *malaka*, to possess). A dynasty of Egyptian sultans who ruled from 1250 to 1517. The name was originally applied to the Turkish slaves who were brought in large numbers into Egypt and came to constitute the main strength of the army, filling at the same time the highest posts in the state. In time the Mamelukes were recruited by large numbers of Circassian slaves. In 1250 the last Ayubite ruler died and the power fell into the hands of the Emir Eybek, who married Sheger ed Durr, the mother of the dead monarch. The dynasty founded by Eybek is known as that of the Bahrite Mamelukes. Eybek was murdered in 1257 by his wife, and the government was assumed by the Viceroy Kutuz, who in 1260 gained a notable victory over the Mongols, and established his power over Syria. The celebrated Bibars ruled from 1260 to 1277. He waged war against the Christians in Syria, and in 1268 put an end to the principality of Antioch. His armies overran Armenia and penetrated far into Asia Minor. His power towards the south extended as far as Nubia. Al Mansur (1279–90) carried on successful wars against the Mongols and Christians. He took Damascus and made himself master of Tripolis, which for two centuries had been held by the Christians. Al Mansur's two sons ruled in succession and increased the power of the sultanate, while at the same time the condition of the people was improved by the construction of important public works. Cairo was greatly beautified and rose in importance as one of the capitals of the East. There followed a period of steady decline during which the real power passed from the hands of the sultans to the commanders of the troops, which were now largely composed of Circassians. In 1389 the last Bahrite ruler was deposed and Barkuk, first of the Circassian or Burji Mamelukes, ascended the throne. During the reign of Barkuk Egypt was threatened by the power of Timur, who wrested from Barkuk's son, Faraj, a great part of Syria. Barsa Bey (1422–37) reduced Cyprus to the position of a vassal state and exercised considerable influence in the eastern Mediterranean. Kait Bey (1468–96) carried on war against Sultan Bajazet II in support, partly, of the claims of the latter's brother, Jem. After Kait Bey's death five sultans ruled within as many years, most of them perishing by assassination. In 1501 Kansuh el Ghuri was raised to the throne. After reigning for 15 years he engaged in war with the Turkish Sultan, Selim I, and was overthrown and slain in a sanguinary battle at Marj Dabik, near Aleppo (1516). The Mamelukes under Tuman Bey II resisted the invasion of Egypt by Selim and fell in large numbers on the field or during their desperate defense of the capital. Their dynasty disappeared from the throne and Egypt became a Turkish province (1517). To conciliate the surviving Mamelukes, Selim divided Egypt into 24 military provinces and placed Mameluke beys over them subject to the supreme authority of a Turkish pasha. With the decay of the Turkish Empire the Mameluke beys arrogated to themselves greater powers and finally ruled in almost virtual independence. Napoleon encountered the Mamelukes under Murad Bey in the battle of the Pyramids, July 21, 1798, and utterly defeated them. After the expulsion of the French from Egypt the Mamelukes contended with the Turks for dominion. The ambitious Mehemet Ali (q.v.) determined to crush and exterminate this military aristocracy. On Aug. 17, 1805, more than 100 of the Mamelukes were enticed into Cairo and slaughtered. On March 1, 1811, treachery was again resorted to and about 470 Mamelukes were shot down in the citadel at Cairo. This was followed by a general slaughter of Mamelukes all over Egypt. A remnant of them fled to Nubia, where they were followed by Ibrahim Pasha (q.v.), who put to death some and dispersed the rest. With their disappearance Egypt was rescued from the conditions of anarchy into which the struggle of the beys had plunged it for so many years. Consult Makrizi's history of the Mameluke sultans, translated by Quatremère (3 vols., Paris, 1837–41), and William Muir, *The Mameluke or Slave Dynasty of Egypt, 1260–1517* (New York, 1906).

MAMER′CUS. The son of Numa Pompilius, and the name of a prominent Roman family of the Æmilian gens which traced its descent to him.

MAMER′TINE PRISON, THE, called also the *Carcer Tullianum*. One of the few remains of the ancient Rome of the royal period and, next to the walls of Roma Quadrata, the earliest building extant. It is of three periods: to the earliest—supposed traditionally to be the time of Ancus Marcius—belongs the lower chamber; to the second, still in the royal or more probably the early republican era, belongs the upper chamber; to a restoration of much later date (Tiberius) is due the façade built when part of the circular chamber was cut off. The original chamber was circular, with a false pointed dome, its walls being built of large blocks set in overhanging courses. It is a matter of dispute whether this chamber was used as a well, a theory favored by the name Tullianum (from *tullus*, "a spring"), or as a royal or princely tomb, a theory favored by many analogous examples and by the absence of water corrosion. When the upper chamber was built, presumably for a prison (Livy i, 33, 8), the builders discovered the earlier building below it and made an awkward connection by cutting off the upper part of the false dome and covering the opening with flat slabs which formed the floor of the upper chamber, with a connecting trapdoor. This floor was considerably above the level of the Forum, on the declivity, and was reached by a flight of stairs called the Scalæ Gemoniæ (stairs of sighs), where the execution of important prisoners took place and their bodies were exposed during the triumphal processions before the ascent to the Capitol. The Mamertine Prison itself is connected with many of the most tragic events of Roman history. Its horrors were described by Sallust. King Jugurtha was starved in it, and Lentulus, Cethegus, and others who had conspired with Catiline were killed here. The popular tradition that St. Paul was confined here rests on no solid foundation.

MAMER′TINES (Lat. *Mamertini*, sons of Mars). The Campanian mercenaries of Agathocles (q.v.), ruler of Syracuse, hired by him to defend Messana in his interests against the Carthaginians. By 282 B.C., however, they had seized the town of Messana (see MESSINA) and were instrumental in bringing on the First Punic War. Beset both by the Greeks, led by Hiero of

Syracuse, and by the Carthaginians, the Mamertines appealed for aid to Rome. This the Senate hesitated to grant, but it was voted by the people, and war with Carthage followed. Consult E. S. Schuckburgh, *History of Rome* (London, 1894).

MAMERTUS, Claudianus. See Claudianus Mamertus.

MAMIANI, mȧ-myä′nė̂, Terenzio, Count Della Rovere (1799–1885). An Italian writer, philosopher, and statesman, born at Pesaro. From boyhood a patriot, he was concerned in the revolt that followed the accession of Gregory XVI, was captured by the Austrians, and after a short imprisonment went to France. Upon his return to Italy in 1847 he held the post of Minister of the Interior under Pius IX from May to August, 1848. He then went to Turin, where he founded with Gioberti the Society for the Advancement of Italian Unity. He was recalled to Rome, and after the flight of the Pope took the portfolio of Foreign Affairs under Galetti, but held it only for a few weeks. When the French took the city in 1849 Mamiani retired to Genoa, where he established the Academia di Filosofia Italica. He was elected Deputy from Genoa in 1856, and later Cavour gave him the post of Minister of Public Instruction (1860). Here he left a strong influence on the future of Italian education. Afterward he was made Minister to Athens in 1861 and to Bern in 1865. He was also professor of history and philosophy at the University of Turin and editor of *La filosofia delle scuole italiane*. Mamiani's intellect embraced and penetrated to some depth all the principal problems of Italian thought, art, politics, and religion during the reconstruction period of the nineteenth century. His work, although too diffuse to rank preëminently in any one field, is profoundly characteristic of his time. In criticism he was a Manzonian, in politics a stanch supporter of Cavour; in philosophy, at first an empiricist, he ultimately modified his views to conform more nearly with the idealism of Rosmini and Gioberti. All his work is colored with the nationalistic impulse of the Italian *Risorgimento*. His works include: *Poesie* (1857); *Del rinnovamento della filosofia antica italiana* (1834); *Dialoghi di scienza* (1848); *Le confessioni di un metafisico* (1865); *D' un nuovo diritto Europeo* (1859); *Psicologia di Kant* (1877); *La religione dell' avvenire* (1879); *Critica delle rivelazioni* (1880). Consult Mestica, *Poesie e prose scelte di Terenzio Mamiani* (Castello, 1886).

MAMIL′IA GENS. A plebeian gens at Rome, originally a family of Tusculum which traced its origin to Mamilia, the daughter of Telegonus, the reputed founder of Tusculum. It comprised three families, whose cognomina were Limetanus, Turrinus, and Vitulus.

MAMMÆ′A. See Mamæa.

MAMMAL. See Mammalia.

MAMMA′LIA (Neo-Lat. nom. pl., from Lat. *mammalis*, relating to the breast, from *mamma*, Gk. *μάμμη*, *mammē*, breast). The highest class of vertebrates, which includes man, his domestic animals, and all others that suckle their young—the mammals. Mammals are warm-blooded; i.e., the temperature of the body is kept approximately at a fixed point, generally higher than that of the surrounding medium. The fixed optimum temperature differs in different mammals, but it is about 100° F.

Development and Nourishment of Young. The most distinctive character of the mammalia is their mode of development and of nourishment during the earliest period of life. Excepting only the lowest forms (Prototheria), all are brought into the world alive, not merely by the retention and hatching of the egg within the oviduct, but by the formation of a new connection between the embryo and its mother. The minute ovum (see Embryology, Human) on reaching the uterus (or womb) connects itself by a set of rootlike tufts of vessels with the maternal vessels in the wall of the uterus. These tufts form an organ called placenta, by which the embryo absorbs nutriment from the mother's blood, and which conveys back to the mother's circulation for excretion by her the waste products of metabolism.

All mammals nourish their young (which at first are unable to digest any other sort of food) upon milk (q.v.), a richly nutritious fluid secreted by the mother's body in "mammary" glands, which become greatly developed in the female during the periods of gestation and lactation; and, as this is found in no other class, it is the character by which the entire group is most positively defined, and from which it derives its name. The mammary glands exist in both sexes, but, except in very rare cases, it is only in the female that they secrete milk. Their number is never less than two, and, when more, is generally nearly proportional to that of the young produced at each birth. That there is direct connection between the number of young and the number of teats has recently been shown in the case of ewes which have been bred to throw two, three, or more young at a birth. In such cases the number of teats has increased proportionately. Their position varies, being determined in each case by convenience of approach by the suckling young. In the whales, where prolonged sucking would be difficult on account of their aquatic life, the ducts of the glands are dilated to form a reservoir from which the milk is ejected into the mouth of the young by a compressor muscle of the mother. In the Prototheria (q.v.) the mammary glands have no teats, but the milk simply oozes out through numerous pores. In the marsupials the teats are well developed, but the glands are provided with special muscles by which milk is forced into the mouth of the extremely rudimentary young in the mammary pouch. The skin in the mammalia produces a covering of hair (q.v.), which is a peculiar characteristic of this group, so that it would be a sufficient definition of a mammal to say that it is an animal producing hair. In some, however, it is modified into bristles, scales, and other unusual forms, or it may be almost wholly absent, as in whales.

The general structure is typified by that of man and is abundantly described elsewhere, so that no more need be said here than a few words in reference to the cranium. Among the most characteristic points in the mammalian skull it may be mentioned generally (1) that the lower jaw articulates directly with the skull, there being no intervening tympanic bone, such as occurs in the other vertebrates; and (2) that the occipital bone of the skull articulates with the first vertebra by two condyles, one on either side of the occipital foramen, as in amphibians, instead of by a single condyle, as in the reptiles and birds. In proportion as a mammal is remote in relationship from man we find that the cranium is diminished; that the face is prolonged by extension of the jaws and nasal cavities; that the orbits are directed outward, and are less distinct from the temporal fossæ; and that the occipital foramen and condyles are placed towards the posterior part of the skull, instead of occupying the middle of its inferior surface, as in man. For further information as to anatomy and physiology, see the articles Skeleton; Teeth; and those upon the various organs and functions of the human body, with the articles on comparative anatomy accompanying them; also articles upon the various groups of mammals, as Carnivora; Ruminant; Elephant; and the like.

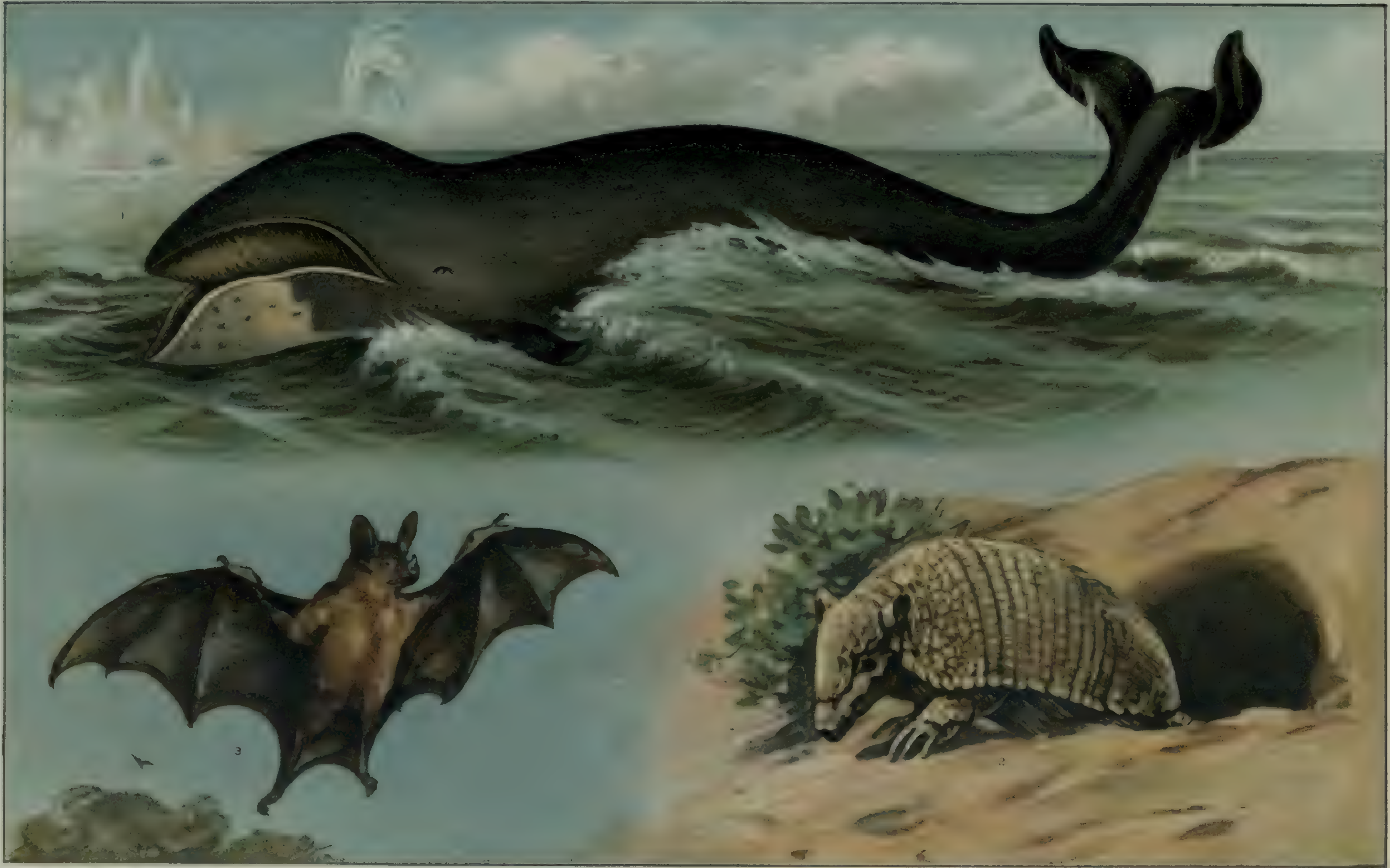
Mammals are very generally distributed over the surface of the globe, and the details in regard to the distribution of the various subclasses and orders are extremely interesting. Among some of the most important facts may be mentioned the absence of mammals from New Zealand and oceanic islands; the restriction of monotremes and all marsupials (except the American opossums) to Australasia; and the peculiar mammalian fauna of Madagascar. See Distribution of Animals.

With respect to their natural history, the part they play in the interrelations of the living world, and their economic service to man, a large volume might easily be written. Mammals are found under all possible conditions of life; they inhabit the air, trees, surface of the earth and subsoil, and fresh and salt water, from the equator to the poles. They thus exhibit an extraordinary variety of adaptations, and are affected by and react upon all conditions of existence. Where room is almost unlimited and food abundant and perennial, great size is attained, as in the whales, which reach a length of 100 feet and corresponding bulk and weight; elephants, which may weigh five tons; and the great grazers, which often exist in vast herds; and, on the other hand, many forms, adapted to a very limited range of vital conditions, are minute in size. Between these extremes is a wide range of size, power, and adaptability to climate and food, so that hardly any organic thing, alive or dead, escapes being eaten by some mammal. On the other hand, they themselves form the food of each other and of all other flesh-eating creatures in a greater or less degree. In respect to food the mammals fall into two great categories—vegetable feeders and flesh eaters, with a few forms that may be omnivorous. The vegetable feeders (Edentata, Sirenia, Ungulata, and Rodentia) are likely either to be of large size or exceedingly numerous in individuals, or both. They are ill provided with weapons of defense or offense; trust for safety to powers of swift escape or of skillful hiding; and as a rule are sluggish and inferior in brain power. It is their part (from the present point of view) to elaborate from the semicrude nutriment in vegetation the more compact and highly nutritious substance called flesh, which is to be used by their superiors in organization; their mission in life is to provide a prepared food for the carnivores. These qualities also make them useful to man, and it is from this class that he derives almost everything in the way of food, oil, clothing, and service which animals contribute to his welfare.

The flesh eaters include two aberrant groups—the aërial insect-catching bats and the marine Cetacea, the latter, by the peculiarities of their respective habitats and the restricted character of their food, having a special place and special functions. A few forms of antiquated organization, small size, much restricted range, and inferior abilities generally feed upon insects alone (Insectivora) or in large part (Primates), and share the perils of the vegetable eaters. The greater part of the flesh eaters, however, form a group (the order Carnivora) which in complexity of organization, power, resourcefulness, and general ability stands at the head of the animal kingdom. Whatever may have been the case with the extinct and unknown ancestry of man, there is no question that the cats and weasels and their kin are far superior even to the anthropoid apes in those powers and abilities which make for mastery in the animal world. These remarks have applied mainly to the eutherian mammals; but a similar division is found in the Metatheria (marsupials); and this circumstance is an argument in favor of the theory of the independent origin and development of that group, and opposed to the view which regards it as a stage in the evolution of the mammalian stock. In both groups the vegetable feeders are numerous, large, timid, comparatively defenseless, and without either means or desire for aggression, except as between males of the same species. They get their food with comparatively little exertion, and, except in the case of certain rodents, have had occasion to develop few instincts or mental faculties. Their whole life is passed in an effort to escape by fleetness or to find and keep a hiding place; and here mainly have been developed such devices as illustrate protective coloration and mimicry (q.v.) in this branch of the animal kingdom.

The carnivores, on the other hand, have been compelled to work day by day for their subsistence. They have been obliged to overcome by strategy and cunning, as well as by force, the greater size and speed of many of the vegetable eaters, and to oppose quickness, patience, and wit to the numberless defensive and protective abilities and devices of the smaller and more secretive animals; and they have been forced to do this in close and constant competition with other carnivores. Hence the apparatus of claws and carnassial teeth, developing the canines rather than the incisors; the tireless, efficient muscles; the capability of sudden tremendous exertion and equally of great endurance; the vigilance, courage, subtlety, and resourcefulness which characterize cats, wolves, foxes, dasyures, weasels, and lesser beasts of prey. Developed by such a history of contest and courage, it is not strange that ferocity and self-reliance should characterize the disposition of the carnivores, nor that mankind in its progress towards peace has found itself in competition with them for the possession of the best of their prey—the edible herbivores—and also at war with them for its own defense. It is wonderful, however, that man should have derived from this class such friends and helpers as the cat and dog, and no stronger evidence could be adduced in favor of the proposition that the Carnivora represent the highest animal mental development than the tractability of the dog and cat and the mental qualities they have exhibited under man's control and tutelage.

MAMMALS OF EARTH, AIR, AND WATER



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1 GREENLAND RIGHT WHALE - BALÆNA MYSTICETUS - 2 GREAT ARMADILLO - DASYPUS GIGAS
3 SPECTRAL BAT - PHYLLOSTOMA SPECTRUM

Classification. Linnæus (1766) divided the mammals into seven orders: Cete, Belluæ, Pecora, Glires, Feræ, Bruta, Primates. Of these orders the Cete, Glires, and perhaps Belluæ and Pecora were natural groups quite similar to some of our modern orders. But under Feræ were grouped opossums, moles, hedgehogs, weasels, bears, dogs, cats, and seals; evidently the use of animal food was the principal character common to such an assembly. Under Bruta, moreover, such widely different animals as elephants, anteaters, and sloths were united. Finally, in the Primates, not only were man and monkeys associated, but even the bats were included. Cuvier reformed this arrangement as a result of extensive anatomical investigations. He recognized nine orders of mammals, as follows: Bimana, Quadrumana, Carnivora, Marsupialia, Rodentia, Edentata, Pachydermata, Ruminantia, Cetacea. There is little that is really unnatural in this arrangement, and it remained in popular use down to the very close of the nineteenth century. Cuvier regarded man's intellectual qualities as such as to rank him in an order apart from the monkeys, a backward step from Linnæus' arrangement. His Bimana and Quadrumana are now fused as Linnæus' Primates, and Cuvier's Pachydermata and Ruminantia are likewise united; but his other orders stand substantially as made. After the doctrine of organic evolution was generally accepted, the tendency was towards a far more elaborate and complex classification among both animals and plants. As a result, some of the proposed classifications of mammals suggested no less than 25 orders; but the pendulum soon reached its limits on that side, and we are now far nearer a natural classification than we have ever been previously. It is generally agreed now that the class Mammalia is very naturally divisible into two subclasses, according to the arrangement of the reproductive organs and the relations between mother and offspring. The primary divisions ought to be based on such characters, for it is in just those characters that the mammals stand out in sharpest contrast to the other vertebrates. These two subclasses are known as:

1. Prototheria, or Ornithodelphia—mammals without teats.

2. Theria, or Eutheria—mammals with teats, arranged according to two plans:

a. Metatheria, or Didelphia.

b. Eutheria (proper), or Monodelphia.

In the Prototheria the female reproductive organs resemble those of birds. There is no vagina, the oviducts opening separately into the cloaca, and the uteri are merely enlargements of the oviducts. The eggs contain much yolk, are supplied with albumen and covered with a shell as in reptiles and birds. They are laid in a nest at the end of a burrow and are hatched very soon, possibly in 24 hours. The mammary glands have no teats, any part of the longitudinal depression along the centre of the abdomen (the primitive pouch) serving that purpose when the sucking mouth of the young one is applied to it. This group contains but one order of living mammals, Monotremata.

The Theria are mammals in which the mammary glands are provided with teats, and there is a more or less perfect allantoic development. These two facts, especially, have led zoölogists to join into a single group the Metatheria and Eutheria, hitherto regarded as separate groups of coördinate rank with Prototheria. These groups are thus distinguished:

In the Metatheria (Didelphia of early authors) the oviducts of the female are united in a longer or shorter part of their length, and there is no cloaca, though the urogenital and anal openings are surrounded by common sphincter muscle; each oviduct possesses a well-formed uterus. There are thus two uteri, whence the name Didelphia. The eggs of the Metatheria have little yolk and no shell. They lie in the uteri without becoming very firmly united to the walls, in some species not at all; in others, however, there is formed quite a distinct placenta. (The foregoing groups have been called Aplacentalia.) But the young remain in the uteri only a short time; even in the giant kangaroo, the largest of the subclass, they are born on the thirty-ninth day. When born, they are transferred by the mother to her pouch, where each one is placed on a teat, to which it clings automatically. This interesting subclass, like the preceding, contains but one order, the Marsupialia (q.v.).

The Eutheria comprise all the remaining (higher) mammals. In these the marsupium is absent, the vagina is fully formed and single, and there is only one uterus. The egg of the Monodelphian mammal is very minute, almost without yolk, and becomes closely connected with the wall of the uterus as soon as it enters that organ. (Hence this group has been called Placentalia.) The young develop there in closest union with the mother until their various organs are all distinctly formed and they are in condition to take milk from the mammary glands by their own efforts; but even after birth they are tended and protected by the mother. The vast majority of the 10,000 known species of mammals belong in this subclass. It has proved the dominant, the successful type. Australasia is the only land the placentals do not possess, and there geographical barriers have served to protect the marsupials from being crushed by their successful rivals. The classification of Eutheria is not easy to agree upon, but the following outline is that of Parker and Haswell (see CLASSIFICATION OF ANIMALS):

SUBCLASS EUTHERIA

Section I. *Metatheria.*
  Order Marsupialia—Marsupials.
Section II. *Eutheria vera*—Higher mammals.
  Order 1. Edentata—Edentates.
  Order 2. Cetacea—Whales, dolphins, etc.
  Order 3. Sirenia—Manatees, dugongs, etc.
  Order 4. Ungulata—Hoofed mammals.
  Order 5. Carnivora—Beasts of prey.
  Order 6. Rodentia—Rodents, or gnawers.
  Order 7. Insectivora—Insectivores.
  Order 8. Chiroptera—Bats.
  Order 9. Primates—Man, apes, and lemurs.

Still more recently several authors, Osborn (1910), Gregory (1910), and Scott (1913), have published classifications of the Mammalia including extinct forms. The following expresses the latest ideas on general ordinal relationships existing between mammals living on the earth today:

SUBCLASS EUTHERIA

Infraclass DIDELPHIA.
  Order *Marsupialia.*

Infraclass MONODELPHIA.
Cohort UNGUICULATA. Clawed mammals.
Order *Insectivora.*—Insect-eating mammals.
Order *Dermoptera.*—The flying lemur.
Order *Chiroptera.*—Bats.
Order *Carnivora.*—Beasts of prey.
Order *Rodentia.*—Gnawing mammals.
Order *Edentata.*—Sloths, hairy anteaters and armadillos.
Order *Pholidota.*—Scaly anteaters.
Order *Tubulidentata.*—The aard-vark.
Cohort PRIMATES.—Mammals with nails.
Order *Primates.*—Lemurs, monkeys, and man.
Cohort UNGULATA.—Hoofed mammals.
Order *Artiodactyla.*—Even-toed hoofed mammals.
Order *Perissodactyla.*—Odd-toed hoofed mammals.
Order *Proboscidea.*—Elephants.
Order *Sirenia.*—Sea cows and dugongs.
Order *Hyracoidea.*—Conies.
Cohort CETACEA.—Whales, dolphins, porpoises.
Order *Odontoceti.*—Toothed whales, dolphins, porpoises.
Order *Mystacoceti.*—Whalebone whales.

Fossil Mammalia. Most of the mammalian orders of modern times can be traced back to an early Tertiary period, but before then only scattered synthetic or generalized types are known. In the late Paleozoic (Permian) and the earliest Mesozoic (Lower Triassic) rocks are found remains of the so-called Theriodontia (see REPTILE), which possess characters remarkably mammalian in expression. These late, highly specialized reptiles are probably related to the rootstocks from which the most primitive ancestral forms of mammals of the Triassic and Jurassic were evolved. The known mammals of the early Mesozoic were of very small size, not larger than rats, and, as they are known chiefly by their jaws and teeth alone, some of which are of very primitive type, while others are of aberrant types, they can with difficulty be assigned to any of the later groups of the class. A few of these fragmental remains can scarcely be distinguished as either reptiles or mammals, for their teeth show characters which are possessed both by certain theriodont reptiles and by the undoubted early mammals. Such forms are *Dromatherium* and *Microconodon* of the Upper Triassic of North America. The principal genera of supposed prototherian mammals (archaic Monotremata) are *Microlestes* of the European Upper Trias, *Tritylodon* of the Karoo formation of South Africa, and *Stereognathus* of the English Lower Jurassic, *Plagiaulax*, *Bolodon*, *Ctenacodon*, *Ptilodus*, and *Polymastodon*. These are known mostly from small jaws containing a pair of ratlike incisor teeth, several premolars, of which the hindmost is the largest, and the outer edges of which are marked by oblique furrows (see illustration under DUCKBILL), and finally two to four small molars. These molars are multituberculate, and hence the above-mentioned genera are grouped in an order called Multituberculata or Allotheria. A well-preserved skull of a multituberculate (*Ptilodus*) of the Basal Eocene of Montana has raised the question whether the whole group should be regarded as early offshoots of the Monotremata or as aberrant marsupials. The other order of prototherian mammals, the modern Monotremata, is separated from the first order by almost the entire space of Tertiary time. One of these creatures, the duckbill, though toothless in its adult state, may betray its origin from a multituberculate ancestor by having in its younger stages of growth broad flat teeth which are somewhat like those of the Multituberculata.

The second subclass of primitive mammals, the Metatheria, comprises a single order, the Marsupialia, and this is divided into two suborders. The more primitive Polyprotodontia are characterized by the presence of four or five incisor teeth on each side in each jaw, and include the majority of Mesozoic mammals of Europe and North America; also the opossums (Didelphidæ), which are known first in the Laramie (Upper Cretaceous); the carnivorous marsupials (Dasyuridæ) of Australia, which can be traced back only into the Pleistocene; the bandicoots (Peramelidæ) of Australia; and the banded anteaters (Myrmecobidæ), of which no early fossil forms have been found. All these are animals of comparatively small size, and they present various adaptations of the marsupial type to particular conditions of existence. The most important Mesozoic genera of supposed Polyprotodontia are *Phascolotherium*, *Amphitherium*, *Amblotherium*, *Triconodon*, *Dryolestes*, and *Spalacotherium*, and several others chiefly from the Upper Jurassic rocks of England and Wyoming. The remaining suborder of Metatheria, the Diprotodontia, is characterized by the presence of two large incisor teeth in each jaw, and its fossil and recent forms are almost wholly confined to Australia. This suborder contains the gigantic *Diprotodon*, its smaller ally *Nototherium*, and the peculiar "pouched lion" of Owen (*Thylacoleo*), all extinct and found in Pleistocene deposits; also the modern wombats, kangaroos, and phalangers, fossil forms of which have been found in the superficial deposits of Australia and South America. The geological record of the history of the Mammalia during the whole Mesozoic is exceedingly imperfect, which is the more to be regretted as during the Jurassic and Cretaceous periods the ancestors of the existing orders were already in course of differentiation; so that in the Eocene epoch, when the record becomes fairly satisfactory, the modern orders were already established, leaving only family, generic, and minor changes during the Tertiary.

Among the Eutheria or third subclass (often called Placental Mammals) the Edentata and Cetacea are of uncertain origin. They are first known as aberrant eutherian types in the Eocene, and they present through the Tertiary degenerating series of peculiar animals. The Edentata may well represent a late Mesozoic stock. During the Tertiary they developed some odd gigantic beasts—*Megatherium*, *Mylodon*, *Megalonyx*, and *Glyptodon* (q.v.), the latter with a massive coat of armor plate. Related to these giant forms were the small ancestors of the modern sloths, anteaters, and armadillos. The Cetacea is a group of mammals which through degeneration from the normal mammalian type has become peculiarly specialized and adapted to a fishlike habit of life. The earliest form in the Eocene, *Zeuglodon*, though distinctively whalelike, has, among other characters typical of terrestrial mammals, the carnivorous type of dentition.

The hoofed mammals are known first in the lowest Tertiary deposits of North America as forms (suborder Condylarthra) that are structurally near to the earliest carnivores. These early ungulates (typified by many genera of the Lower Eocene, including *Phenacodus* from the Lower Eocene of Wyoming) have five useful toes on their plantigrade feet, and each toe has a small narrow hoof. The brain is small and slightly convoluted, and the teeth are of a generalized type with low crowns and many tubercles. From animals much resembling the primitive Condylarthra seem to have been evolved all the later and more specialized forms of ungulates. The Perissodactyla comprise the extinct Titanotheroidea, large horned animals of Eocene and Miocene time (see TITANOTHERIUM); Hippoidea, the horses and their Eocene allies the paleotheres (see HORSE, FOSSIL); Tapiroidea, including the tapirs and their extinct Eocene and Miocene allies the Lophiodontidæ; Rhinocerotoidea, the rhinoceroses, with a host of extinct ancestors reaching back into Eocene time; and the Chalicotheroidea, a peculiar group of Perissodactyla characterized by clawlike hoofs. The Amblypoda include five-toed ungulates of large size that lived during Eocene time, of which well-known genera are *Coryphodon* and *Dinoceras*. Artiodactyla, or even-toed ungulates, include the modern pigs, hippopotamus, camels, deer, cattle, etc., with long series of forms ancestral to these ranging back through Tertiary time. (See SWINE; CAMEL; HIPPOPOTAMUS; DEER; ETC.) Here also belong the extinct families: Anthracotheridæ, large animals of the older Tertiary of North America and Europe; Oreodontidæ of the Miocene and Lower Pliocene of the United States; Anoplotheridæ, medium-sized animals from the Eocene and Lower Miocene of Europe; and the Protoceratidæ of the White River Miocene of America. The ancestors of the modern elephants appear in the Upper Eocene rocks of Egypt. (See PALÆOMASTODON.) The evolution of the group during Tertiary time is manifested especially in complication of the dentition and in the development of tusks and proboscis. The Toxodontia, Typotheria, and Litopterna are suborders containing peculiar types of ungulates of uncertain affinities found in the Tertiaries of South America; and the Hyracoidea embrace only a few obscure fossil forms from Egypt and Europe. See ELEPHANT; MAMMOTH; MASTODON; ETC.

The Carnivora are known first in the Eocene with generalized carnivorous types as Creodonta (q.v.) that are akin to the early ungulates; in fact, the Creodonta is considered to be the ancestral group of both the Ungulata and the Carnivora. Eight families of creodonts are recognized, mostly from the Eocene of Europe and the United States. The more important genera are *Arctocyon, Mesonyx, Patriofelis, Hyænodon.* Some creodonts found in the Santa Cruz formation (Lower Tertiary) of Patagonia present interesting marsupial features. The true carnivores have larger, more deeply convoluted brains and strong sectorial teeth, with an accentuation of all other carnivore characteristics. The dogs, bears, weasels, civet cats, hyenas, cats, all have ancestral lines extending more or less into the early Tertiary, and some instructive phylogenetic series have been demonstrated. The marine carnivores (Pinnipedia) have not yet been surely linked with any particular terrestrial types.

The shrews and moles of Eocene time present less marked differences from their modern descendants than do any other types of mammals. Almost nothing is known of the ancestry of the bats. Among the Rodentia, the characteristic feature in the dentition, viz., the chisel-shaped incisor teeth growing from persistent pulps, is seen in fossils from the early Eocene. Such a form is *Paramys*. The hares, rabbits, rats, mice, squirrels, and beavers are known first in the Oligocene and Miocene. *Tillotherium*, often quoted as ancestral to the Rodents, is merely a rodent-like, early placental mammal.

The Primates are represented in the Eocene beds of North America and Europe by fossils which represent the Lemuroidea (e.g., *Notharctus, Adapis*), and the *Tarsius* group (*Anaptomorphus, Necrolemur*) in primitive stages. The earliest monkeys are *Homunculus* of the Miocene of Patagonia, representing the New World apes, and *Propliopithecus* of the Lower Oligocene of Egypt, representing the Old World apes, in a primitive stage. *Propliopithecus* is regarded by Schlosser as the forerunner of the group which includes the great apes and man. In the Miocene and Pliocene deposits of Europe appear apes which are closely allied to the modern genera of Africa and Asia.

The earliest-known member of the human family is the celebrated *Pithecanthropus* (q.v.) from the Pleistocene of Java; here may also be mentioned *Eoanthropus* of the Old Stone age in England, *Homo heidelbergensis*, the Neanderthal race (q.v.), and the Piltdown man. See MAN, SCIENCE OF, *Ancient Types.*

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MAMMALS. See Mammalia.

MAM'MARY GLAND. See Breast; Mammalia.

MAMMARY GLAND, Diseases of. The following are some of the most important of the affections of this gland:

Acute inflammation of the breast (*mastitis* or *mastodynia*) is characterized by great swelling, tenderness, pain, and fever. There is a knotty feeling in the inflamed part, and pus soon forms; but the abscess is often slow in pointing. The affection may occur at any period of lactation, and sometimes arises from very trifling causes—as constipation, too stimulating a diet—or more frequently is preceded by a condition known as caked breast, which in turn arises from excessive secretion with retention of milk. The bowels should at once be cleared out by sharp purgatives; fomentations should be applied; the arm on the affected side should rest in a sling; and an incision should be made to evacuate the pus. The milk should also be regularly drawn off by means of a pump, if it can be done without extreme pain. *Chronic mastitis* is an inflammation of the interstitial fibres supporting the lobules of the breast and is of importance on account of the pain and anxiety it causes and because it is often mistaken for beginning cancer. The involved parts are hard and nodular, and tender to the touch. The affection is most common at the menopause, but may occur earlier and be associated with disorders of the menstrual function. Treatment is unsatisfactory. It is of first importance that a diagnosis be made for cancer, and the patient should be frequently examined to make sure of this.

Sore nipples are a frequent cause of the preceding disease. Among the remedies for excoriations, cracks, fissures, and ulcerations of the nipple, which cause great pain in suckling, are the application of strong astringent lotions (tannin lotion, *e.g.*), touching the sore point with solid nitrate of silver (lunar caustic), and especially the application of collodion. In bad cases a metallic shield must be placed on the nipple to protect it from the clothes and from the child's mouth. The regular application of alcohol and olive oil in equal parts will sometimes prevent this affection.

The mammary gland is also liable to hydatid disease, to tumor, cyst, cancer, galactocele, galactorrhœa (excessive flow of milk). See Hydatid; Tumor.

MAMMEE (măm-mē') **APPLE** (Haitian *mamey*, the native name), *Mammea americana*. A highly esteemed fruit of the West Indies (where it is sometimes called the wild apricot) and tropical America, produced by a beautiful tree of the family Guttiferæ, 60 to 70 feet high. The fruit is roundish, from the size of a hen's egg to that of a large orange, with a thick, leathery rind, and a very delicate inner rind adhering closely to the pulp. This inner rind must be carefully removed on account of its bitter taste. The pulp is firm and bright yellow, with a peculiarly sweet and very agreeable taste and a pleasant aromatic odor. A similar fruit is produced by an African species, *Mammea africana* (called *Ochrocarpus africanus* by some botanists). The wood of the mammee apple, which is fine-grained, is very valuable for cabinetwork, and, on account of its durability when exposed to moisture, is highly prized. A liquor is distilled from the flowers, which have been first steeped in spirits of wine. There are about half a dozen species of the genus *Mammea*, all of them tropical.

MAMMI'TIS (Neo-Lat., from Lat. *mamma*, breast), Mastitis, Garget, or Inflammation of the Udder. The cattle disease ordinarily known as garget is common in well-nourished cows which are heavily fed at the time of calving. It is especially frequent in heavy milkers. In such cows a slight congestion of the udder is normal at calving time. This physiological condition may be aggravated by exposure to cold air or by neglect to milk regularly for a day or two. The udder then becomes very hot and the milk shows clots and streaks of blood. If these symptoms are not relieved, a general fever condition may be established with a cessation of milk secretion and formation of abscesses in one or more quarters of the udder. In treating the disease, the milk should be frequently drawn and the udder should be thoroughly rubbed with some ointment, such as a mixture of vaseline, gum camphor, belladonna, and henbane. Where the udder is very hard, an ointment made of one dram each of iodine and iodide of potash in four ounces of vaseline may be used. Until recovery takes place the diet should be light, and laxatives, such as Epsom salt, should be administered. Another form of the disease is known as contagious mammitis and is due to infection by a streptococcus. The symptoms are similar to those of garget. Goats are affected by a similar disease known as gangrenous mammitis, which is due to a micrococcus. Treatment of contagious forms of mammitis does not differ from that of the simple form, except that sodium hyposulphite should be given by mouth and antiseptics applied locally. Good results have been obtained by thoroughly blistering with biniodide of mercury and cantharides. Tuberculosis of the udder is frequently mistaken for simple garget. Suspected cases should be tested with tuberculin, since the milk of such cows is dangerous.

MAM'MON. An aramaic word meaning "riches." It is employed in two ways in the New Testament: (1) in Luke xvi. 9–11, where it signifies literally riches; and (2) in Matt. vi. 24 (Luke xvi. 13), where it is used for the god of riches. The phrase "mammon of unrighteousness" also occurs in the Book of Enoch (lxiii. 10) in allusion to Luke xvi. 9. It is not to be concluded, however, that there was a Syrian god named Mammon. The derivation is uncertain, and none of the explanations proffered is satisfactory.

MAM'MOTH (from Russ. *mamantŭ*, mammoth, from Tatar *mamma*, earth; so called because the Yakuts and Tungusians believed that the mammoth burrowed like a mole, since its remains were discovered underground). The woolly elephant (*Elephas primigenius*), the best-known and one of the most recently extinct of fossil elephants, closely related to the existing Asiatic elephant. (See ELEPHANT.) It inhabited central Europe during glacial and postglacial times. At that time the area of the present North Sea was forested land, and thousands of mammoth teeth and bones have been dredged from the sea by fishermen. It may have originated thereabout and moved eastward, for remains have been found throughout Asia; and it passed on by the then existing land connection with Alaska into North America, where it spread over the continent as far south as the central United States. A second species (*Elephas columbi*) has been named from some large bones found in the Southern States. The distinction between these elephants and the more familiar mastodon (q.v.) must be kept clear: the latter was a very different animal.

Though the enormous bones of these and other fossil elephants, and their almost imperishable teeth, have frequently come to light ever since the forgotten antiquity when they were hunted by primitive man, and have been the bases of strange tales, theories, and superstitions, little was known about them until the discovery at the close of the eighteenth century of remains entombed in the ice cliffs of the Siberian coast, where complete animals have been kept in cold storage for unnumbered thousands of years. These and other remains enable us to reconstruct more exactly than in the case of any other fossilized creature the proportions and aspect of this animal. Though the tradition of the marvel which the bones seemed to our forefathers has given to the word "mammoth" a sense of something huge, this elephant probably did not on the average much exceed in size African elephants of the present day. One of the largest known examples—that preserved by the Chicago Academy of Sciences—did not exceed 13 feet in height at the shoulder and had tusks 9 feet, 8 inches long. African elephant tusks 10 feet, 3½ inches long were exhibited in New York in 1900. The largest mammoth tusks ever actually measured, according to Lucas, were two from Alaska, one 12 feet, 10 inches long, weighing 190 pounds, and the other 11 feet long, weighing 200 pounds. Modern African elephant tusks of the same size would weigh 20 per cent more.

HEAD OF A MAMMOTH.

In general form and osseous structure the mammoth resembles the Indian elephant, but the skull differs in the narrower summit, narrower temporal fossæ, and more prolonged bony sheaths supporting the base of the tusks, which were long, comparatively slender, and described a curve both upward and outward. There are great variations in the amount of this curve, from almost straight to a nearly complete spiral, but it is characteristic of the species. Flower says that tusks were doubtless present in both sexes. The molar teeth are peculiar in the great relative breadth of the crown and the narrowness, close approximation, and thinly enameled walls of their transverse ridges. Outwardly the mammoth differed from any other known elephant in the fact that it was clothed with long hair and a dense, woolly underfur, in adaptation to the cold climate of its habitat. Compare MASTODON.

From the earliest times fossil ivory was derived from the buried tusks of these elephants. The ancient Chinese worked in it, and even had such ideas about the edibility of the animal's flesh as make it probable that they knew that carcasses were occasionally found on the Arctic coast. This ivory was known to the Greeks, and the "licorne" sent as a present by Harun al Rashid to Charlemagne is believed to have been a mammoth's tusk. Arabic writers of the tenth century mention it as an article of regular Russian trade, and ever since that time fossil ivory has come from Siberia at a rate calculated to be not less than 100 pairs of tusks a year.

Among the strange conceptions of the animal which furnished this ivory that arose among people unfamiliar with elephants was that of the Chinese, who said it must be a mole, because its remains were always found underground. This was not so illogical as the pious hypothesis in Europe that the bones were those of St. Christopher. The gathering of this antediluvian heritage continues to be a regular business along the Arctic coast. In 1799 one of the ivory hunters discovered in the cliffs of perpetually frozen earth and ice which border the course of the lower Lena River a shapeless mass which three years later, under the influence of a succession of unusually warm summers, had been released from its tomb and fallen to the foot of the cliff. In March of 1803 the hunter visited it and cut off and carried away the tusks, which he sold for 50 rubles. In 1806 the animal was examined by a scientific man. The Yakuts of the neighborhood had cut off the flesh to feed their dogs, and the wild beasts had almost entirely cleaned the bones. The skeleton was, however, nearly entire, and some of the bones were still held together by ligaments. The head was covered with dry skin, and one of the ears, which was well preserved, was furnished with a tuft of hairs. Three-fourths of the whole skin was procured; it was of a dark-gray color, and was covered with a reddish wool, and long black hairs or bristles, forming a long mane on the neck. The entire carcass, together with the recovered tusks, was removed to St. Petersburg, where it is now preserved. Since that period several other carcasses have been disentombed by melting or floods, but, in spite of strenuous efforts, no valuable parts have been recoverable.

What caused the disappearance of the mammoths has not been satisfactorily explained. To judge by the extraordinary abundance of the remains, this elephant must have been excessively numerous throughout most of its range. It seems fitted to withstand any cold to which there is reason to suppose the species was ever exposed, at any rate in the southerly parts of its range. At its period the present treeless areas of northern Asia were covered with forests of pine, upon whose leaves and underbrush the elephants were accustomed to feed. The disappearance of these forests would account for the extinction of this and associated extinct animals in that region, but the question as to the rest of the habitat remains unanswered. There is no doubt that in western Europe, and probably in America, mammoths survived not only the advent of mankind but even his advancement to the neolithic stage. Of this a variety of evidence exists, including unmistakable and really excellent etchings made by the "cave men" of southern France, some upon pieces of the animal's tusk. That those men, assailing the mammoth in numbers, driving it into inclosures and entrapping it in pitfalls, could overcome it cannot be doubted; and it is probable that in Europe the waning species was terminated by man.

The relationship of the mammoth to other fossil elephants, and its place in the evolutionary history of its family, will be found treated in the article ELEPHANT, *Fossil Elephant*.

Consult the authorities mentioned under ELEPHANT; also F. E. Beddard, "Mammalia," in *Cambridge Natural History*, vol. x (New York, 1902); F. A. Lucas, *Animals of the Past* (ib., 1901); W. B. Scott, *History of Land Mammals in the Western Hemisphere* (ib., 1913); O. F. Herz, *Frozen Mammoth of Siberia* (Washington, 1904).

MAMMOTH CAVE. The largest known cavern in the United States, situated in Edmonson Co., Ky., near Green River, 125 miles southwest of Lexington (Map: Kentucky, D 5). The Mammoth Cave—discovered in 1809 by a hunter named Hutchins—consists of a series of caverns that have been explored for many miles. Its mouth is about 600 feet above sea level. Several streams occur in the cave, the principal one being the Echo River, which has a length of nearly ¾ of a mile and communicates through an underground passage with Green River. The Styx, about 450 feet long, is remarkable for a natural bridge of great beauty. Passages and avenues connect chambers or halls situated at different levels, thus showing the slow progress of the underground stream in its course through the earth. The largest chamber—named the Chief City—is 450 feet long and 130 feet wide. Several other large chambers or domes extend through the entire height of the levels. The most notable of these domes are the Stella, Mammoth, and Gorin's, each about 250 feet high, and Lucy's Dome, over 300 feet high and 60 feet in diameter. Cleveland Avenue extends for more than 2 miles and presents a most wonderful variety of crystals and incrustations. All of the halls offer to view numbers of stalagmites and stalactites, whose varied and contrasting shapes or grotesque resemblances to natural or architectural objects, in conjunction with the streams, lakes, cataracts, and fountains, form the wonderfully picturesque scenery of the cavern. Startling effects are produced by the use of lights and fireworks, the Star Chamber showing on its ceiling myriads of glistening points, from which it takes its name.

The Mammoth Cave is but one of an extensive system of caves occurring over an area of not less than 8000 square miles in Kentucky and Tennessee. The process of formation seems to have been as follows: Rain water and melted snow more or less charged with carbonic acid gas, and having the power of dissolving limestone, makes its way downward by means of joints and bedding planes in the rocks, and finally comes to the surface again as springs at levels determined by the larger drainage systems of the country. From the surface downward this flowing water dissolves out sink holes and pipes; in its horizontal progress towards an outlet it carves out the caverns. The gradual lowering of the beds of larger river systems permits lower outlets for these subterranean waters, thus leaving the older galleries dry. The atmosphere of Mammoth Cave varies little from 54° F. the year around. The animal life of the cave consists of a few species of fish and crayfish and several species of insects and bats. Consult H. C. Hovey, *Celebrated American Caverns* (Cincinnati, 1882); id., *Mammoth Cave of Kentucky* (Louisville, 1912). See CAVE ANIMALS.

MAMMOTH HOT SPRINGS. A group of thermal springs in the extreme north of the Yellowstone National Park in northwestern Wyoming (Map: Wyoming, A 1). The waters deposit calcium carbonate in the form of travertine, which covers an extent of over 1000 acres. The deposition of this material has built up a series of basins, some of which have a diameter of nearly 100 feet. The hottest spring is 165° F. These springs have no rival in the world since the terraces of Rotomahana in New Zealand were destroyed by a volcanic eruption.

MAMO, mä′mȯ (Hawaiian name). A peculiar creeper-like bird of the Sandwich Islands (*Drepanis pacifica*), the only representative of the family Drepanidæ and now extinct. Its destruction was brought about early in the nineteenth century, "for the sake of its rich yellow feathers used in former days to decorate the state robes of the chiefs." Very few skins are in existence, and these are preserved in European museums. After the extinction of this bird resort was had to another, the oö or moho (q.v.), to supply yellow feathers, while red feathers for the purpose were obtained from the scarlet creeper (*Vestiaria coccinea*). Consult Wilson and Evans, *Birds of the Sandwich Islands* (London, 1884), and W. Rothschild, *Extinct Birds* (ib., 1907). See MOHO.

MAMORÉ, mä′mȯ-rā′. A river of Bolivia and the principal head stream of the Madeira, being by many geographers considered as the upper course of that river (Map: Bolivia, D 6). It rises on the east slope of the Cordillera Real, not far from Oruro, and flows first southeastward under the name of Río Grande, then north, northwest, and again northward, receiving from the right its main tributary, the Guaporé, after which it forms the boundary between Brazil and Bolivia until it unites with the Beni to form the Madeira. After leaving the mountains it flows partly through extensive grazing plains, partly through immense forests. Its course is throughout so swift that even in the forest region it is continually shifting its bed. The length of the Mamoré is over 1300 miles, and it is navigable for nearly 1000 miles. Most of its tributaries are also navigable after they leave the mountains and enter the great plains. The river is, however, obstructed by falls and rapids, especially those of Guajara, 40 miles above the junction with the Beni, and by dams of fallen logs, so that it is navigable practically over a continuous stretch of only about 400 miles above the Falls of Guajara.

MAM′PALON, or **MAMPELON** (from the native name). A semiaquatic civet-like animal (*Cynogale bennetti*) of the Malayan region, which feeds upon fish, crustaceans, and the like and has many curiously otter-like ways and adaptations. It is a member of the family Viverridæ, related to the hemigales and paradoxures.

MAMUN, mȧ-mo͞on′. A distinguished caliph of the Abbaside line, son of Harun al Rashid. See Al Mamun.

MAN. A food used by Arabs. See Coccidæ.

MAN, Antiquity of. See Man, Science of.

MAN, Henry (1747–99). A friend of Charles Lamb. He was born in London and educated at the Croydon Grammar School, then under Rev. John Lamb. At the age of 15 he became clerk in a London mercantile house. In 1776 he was appointed deputy in the South Sea House, where he formed a friendship with Lamb. He is "the wit, the polished man of letters," sketched by Elia. Man's publications comprise mainly the *Trifler* (1770), essays; letters on education contributed to the *Morning Chronicle* (1774); *Cloacine* (1775), a dramatic satire. Consult *Collected Works*, with memoir (London, 1802).

MAN, Isle of. An island in the centre of the Irish Sea, whence its Manx name *Vannin* or *Mannin*—the middle—16 miles south of Burrow Head and 27 miles equidistant from England and Ireland (Map: England, B 2). It is 32 miles long, 12 miles broad, and 227 square miles in area. At the southwest extremity is an islet called the Calf of Man, containing 800 acres, largely cultivated. The scenery is varied and picturesque. A mountain chain extends from northeast to southwest, culminating in Snaefell, 2034 feet above the sea; from its summit the view embraces the wooded glens and undulating country in the foreground; the rich plains of the north and south of the island in mid-distance; and beyond, the Irish Sea, bounded by the highlands of the surrounding countries. Several trout streams take their rise in these mountains.

The island is situated on the eastern platform of the Irish Sea and belongs physically more to England than to Ireland. It is composed mainly of Silurian rocks and Carboniferous limestones, through which granite bosses have extruded. In these features it is similar to the Lake District of England, of which it is an outlier. Great quantities of lead are extracted annually, as well as considerable quantities of copper, zinc, and iron; the lead ore is the richest in silver in the United Kingdom. The climate is remarkable for the limited range of temperature, both annual and diurnal; westerly and southwesterly winds predominate, easterly and northeasterly winds occurring chiefly in the autumn quarter. Myrtles, fuchsias, and other exotics flourish throughout the year. Agriculture is followed, especially in the southern part of the island and in the level districts to the north. On the hillsides in the interior many cattle and sheep are pastured. The island is noted for a breed of tailless cats. The Isle of Man is a great summer resort for operatives of Lancashire and Yorkshire, and at various points dancing pavilions have been erected. Steamers ply regularly between it and Liverpool, Fleetwood, Barrow, Silloth, and other ports. The herring, mackerel, and other fisheries are important. The manufactures are unimportant, but the natives derive a large income from the thousands of visitors that come to the island each season.

There are many interesting antiquities on the island. Near Castletown, the ancient capital of the island, is the well-known Castle Rushen, which was once the palace of the native kings. Douglas, the capital of the island and its principal seaport, contains the so-called Tower of Refuge, and the former residence of the dukes of Athol. Sixteen miles from Douglas lies Port Erin, a picturesque watering place on a small bay. Between Douglas and Peel, a distance by rail of 12 miles, is Greeba Castle, the residence of Hall Caine, whose writings have done much to make the manners and customs of the Manx familiar to the general public. Peel is remarkable for its castle on St. Patrick's Isle, joined to the mainland by a causeway, which in its present form dates chiefly from the fifteenth century. The ruins of the cathedral stand within the castle inclosure.

The Isle of Man forms a separate bishopric under the title of Sodor and Man. The Manx church has its own canons and an independent convocation. The see is, for certain purposes, attached to the Province of York. There are in the island about 40 places of worship in connection with the Established Church of Man. The livings are, with few exceptions, in the gift of the crown. The principal denominations of dissenters are represented in the island.

The Isle of Man has a constitution and government of its own, and is not bound by acts of the Imperial Parliament unless specially named in them. It has its own laws, law officers, and courts of law. Government is administered by the Court of Tynwald; this consists of the Lieutenant Governor, who is the chief executive officer, the Legislative Council, and the House of Keys. The Lieutenant Governor is appointed by the crown. Besides the Lieutenant Governor, the Council includes the Lord Bishop, the Clerk of the Rolls, the two deemsters, the Archdeacon, the Attorney-General (all of whom are appointed by the crown), and the Vicar-General (appointed by the Bishop). The Council is the upper legislative body and the House of Keys the lower. The latter, a representative assembly, consists of 24 numbers elected by male and female owners or occupiers of property. Legislative acts are valid only upon the signature of the Lieutenant Governor and the assent of the British sovereign in council. The native language, Manx, a dialect of the Celtic, is still spoken, and is taught along with English in the parish schools. It is spoken chiefly in the northwestern parishes and in certain localities on the west coast. It has a marked similarity to the Irish and Gaelic dialects. Public elementary instruction was established in 1872 and secondary instruction in 1907.

In 1912 there were 76,303 acres of arable land and 16,745 acres under permanent grass. To grain crops were planted 22,526 acres, of which 19,302 to oats; turnips and swedes, 8017 acres; potatoes, 2558; clover, sainfoin, and grasses under rotation, 41,684. Live stock (1912): 5978 horses, 21,188 cattle, 80,422 sheep, and

4329 swine. The mineral products include lead, zinc, and salt.

The history of the Isle of Man is involved in obscurity until near the end of the ninth century, when the Norwegian Harald Haarfagr conquered the Welsh kings and took possession of the island. In the beginning of the tenth century, according to the legend, Orry, a Dane, effected a landing, and was favorably received by the inhabitants, who adopted him as their king; he is said to have been the founder of the present Manx constitution. A line of Scandinavian kings succeeded until Magnus, King of Norway, ceded his right in the island and the Hebrides to Alexander III of Scotland, 1266. On the death of Alexander the Manx placed themselves under the protection of Edward I of England by a formal instrument dated 1290; on the strength of this document the King of England granted the island to various royal favorites from time to time, although their possession was contested by the Scottish kings until after the battle of Neville's Cross in 1346. In 1406 it was granted to Sir John Stanley in perpetuity, to be held for the crown of England, by rendering to the King, his heirs and successors, a cast of falcons at their coronation. With the exception of a short period during the Civil War, when the island was surrendered to a Parliamentary force by Receiver-General Christian and was granted to Thomas Lord Fairfax, it remained in the possession of the Stanley family and their descendants until, having been for a long period the seat of an extensive smuggling trade, to the detriment of the Imperial revenue, the sovereignty of it was purchased by the British government, which paid in 1765 £70,000 plus an annuity of £2000 for the customs duties and in 1828 £417,144 for the sovereignty. Pop., 1891, 55,608; 1901, 54,758; 1911, 52,016.

Bibliography. Joseph Train, *Historical and Statistical Account of the Isle of Man* (Douglas, 1845); Cumming, *The Isle of Man: Its History* (London, 1848); the works published by the Manx Society (31 vols., Douglas, 1858–82); H. Caine, *The Little Manx Nation* (London, 1891); S. Walpole, *The Land of Home Rule* (ib., 1893); A. W. Moore, *History of the Isle of Man* (2 vols., ib., 1900); A. Herbert, *Isle of Man* (New York, 1909); W. R. H. Caine, *Isle of Man* (ib., 1909); J. E. Morris, *Isle of Man* (ib., 1911); John Quine, *Isle of Man* (ib., 1912).

MAN, SCIENCE OF. Especially during the later half of the nineteenth century and the opening years of the twentieth, scientific methods were extended to the study of man in various aspects, and a series of special sciences relating to different attributes or characters of the human being grew up. Among these are physiology, craniology, psychology, archæology, sociology, demology, ethnology, and various subdivisions of these, as well as several broader sciences dealing with common attributes of mankind and lower organisms, such as morphology, embryology, ecology, etc. By some writers the several branches of knowledge dealing specifically with the human kind are treated as coördinate and more or less distinct, and by some of these anthropology is applied, as one of the series of coördinate terms, to the science of the human body or somatology. Other writers employ the term "anthropology" in a more general sense, including within its scope the special sciences dealing not merely with the human genus, but with men and their works in all their multifarious aspects; and this usage is to be preferred both on logical grounds and in the interests of convenience. Accordingly the science (or sciences) of man may be defined as equivalent to anthropology in the broad sense, i.e., as including the various branches of definite knowledge pertaining to mankind.

In a broad sense the science of man may be defined as the science of (1) the human organism, (2) the human mind, and (3) the human activities and their products; and these categories correspond respectively with the sciences of (1) somatology, (2) psychology, and (3) demology. These branches of knowledge are themselves complex. Somatology comprises human anatomy, physiology (and pathology, etiology, etc.), craniology, embryology, and ecology, in addition to anthropometry, craniometry, medicine, surgery, constructive hygiene, and other collateral branches; psychology comprises phrenology (of course in the sense of observational knowledge concerning cerebral structure and functions), neurology, etc., together with such collaterals as psychometry, both introspective and experimental psychology, and the inchoate systems of cerebral cultivation sometimes called psychurgy; while demology is more definitely organized as (*a*) esthetology, or the science of arts; (*b*) technology, or the science of industries; (*c*) sociology, or the science of laws; (*d*) philology, or the science of languages; and (*e*) sophiology, or the science of ideas—the last comprising mythology, theology (in certain aspects), philosophy, teleology, and other more or less interrelated systems of thought. There remain certain sciences dealing with special aspects of the field covered by these divisions; thus, ethnology is the special aspect of anthropology pertaining to racial characters and types, while archæology deals with the prehistoric aspects of somatology, esthetology, and technology so far as these are known through relics. So, also, several of the sciences have commonly recognized descriptive aspects, such as craniography, demography, ethnography, etc. The leading divisions and branches of the science are shown in the accompanying table:

Science of man	Somatology	Anatomy Physiology	Anthropometry
		Craniology	Craniometry
		Embryology Ecology, etc.	
	Psychology	Phrenology Neurology, etc.	Psychometry, etc.
	Demology	Esthetology Technology	Archæology
		Sociology Philology	
		Sophiology	Mythology Theology Philosophy Teleology, etc.

Manifestly the science of man as thus defined cannot be treated in detail within moderate limits. Under the title ANTHROPOLOGY the conventional limitations of that science have been defined, and likewise the special articles on the several topics enumerated above may be consulted for each in turn.

ANCIENT TYPES

Recent discoveries in the domain of human paleontology lead to two outstanding conclusions in regard to ancient types of man, for the remains now available for study include some specimens which can only be assigned to beings —or, as the zoölogist terms them, "forms"—of a nature bordering on the very confines of humanity. In the second place a paleolithic type is now known which, though undoubtedly human, differs from all other human forms (extinct or otherwise) so completely as to require the distinction of a separate species. Such a distinction is not accorded readily by anthropologists; it cannot be conferred with justice upon any other variety of mankind in any part of the globe. All existing varieties are assignable to the species *Homo sapiens*, with which one other, viz., *Homo primigenius* (*neanderthalensis*), must be contrasted.

The evidence for these conclusions and the range in time throughout which the two species of the Hominidæ can be traced will be considered in the sequel. But even at the risk of anticipating a verdict, it is well to emphasize the fact that the prehistoric period has now supplied examples of forms differing in certain essential details from modern men, and that two grades can be recognized in the differences detected in the skeletons.

The very mention of the skeleton reminds the student that, when attempts are made to reconstruct prehistoric human forms, the essential materials consist of the actual remains of individuals preserved in a fossil state. Not that these exhaust the means of inquiry or research, for even though the evidence of stone implements be ruled out, the representation of human forms is not unknown, and the latter may be revealed as paintings or even as objects of sculpture. Yet such evidence lacks the cogency provided by the bones themselves, and indeed only the bones are recoverable from those early deposits and periods in which the evolution of man may be expected.

Upon such considerations the present field of survey will be limited to evidence provided by skeletons and the circumstances in which these have been brought to light. A distinction must be drawn here between cave finds and such as have been made in gravel beds or other deposits not inclosed in a circumscribed space. Caves often yield evidence of a kind more precise than that obtainable from an alluvial stratum in the open. Caves were frequently used as habitations, occasionally and alternatively as places of sepulture, and a careful record of the succession of layers or strata in the floor of a cave usually leads to a fairly precise determination of the relative antiquity of any interment that may be encountered. Lastly, skeletons from caves are often perhaps usually much more complete than those found in the alternative conditions of an alluvial deposit.

Such deposits, though encouraging expectation in the highest degree, frequently prove disappointing, and this indeed depends on their very nature. If the reason for this result be sought, it will be found in the fact that in such researches the true value of the bones can be realized only if they are of the same antiquity as the deposit. The torrential floods or boisterous tides which threw the débris up in banks do not tend to good preservation of skeletons. Exceptions fortunately occur where a corpse has been swept into a backwater, there to be silted over and thus preserved.

Such are some of the reasons for contrasting caves with alluvial strata as sources of the bones which may testify to the former existence of mankind. It will be understood that the discovery of a fairly complete skeleton in a gravel bed is in the majority of instances suggestive of an interment subsequent to, perhaps later by many millennia than, the deposition of the material in which the bones were found. Such examples require the support of very complete evidence before contemporaneity can be regarded as proved.

The statement just made in regard to the expectations aroused by the alluvial deposits and their contrast in this respect with cave specimens must now be explained. Alluvial deposits often yield remains of animals, and the study of these remains has assisted enormously the work of classifying the deposits. Some of them are now known to possess a very great antiquity within the limits of that part of the geological time-table with which we are concerned. Announcements appear from time to time testifying to the discovery of human artifacts such as stone implements in even the more ancient of these deposits. Such discoveries (of implements) produce an effect even when no human remains are discovered in the same place or on the corresponding horizon. One result is to stimulate the search for the makers of the implements in the places or horizons concerned. Of late years announcements of the discovery of implements made by man in times of the remotest antiquity have been numerous and more confident than ever before. Without prejudice indeed they may be termed sensational, and in consequence estimates of the duration of human existence are correspondingly affected.

Cave deposits rarely if ever carry us back to those remoter epochs represented by the more ancient alluvial deposits, which are thus shown to be capable of extending the evidence of man's presence backward to an incomparably greater degree. But the anthropologist who desires above all to avoid errors must of necessity scrutinize with every care the evidence for the antiquity of the deposit, as well as that submitted in support of the artifacts. The claims made for the implements, to the effect that they are artificial and not the result of some natural process, must not be overlooked, and all such inquiries pave the way to a further investigation, which arises only when human bones are found in the like suspicious surroundings.

The foregoing remarks will serve as an introduction to the scheme or chronological arrangement of the more important remains of prehistoric man. The tabulation presented on page 750 will serve conveniently the purpose of a more detailed account of the relations of the various specimens. Marks of distinction show the origin of each, i.e., whether from an alluvial deposit or from a cave. In the earliest series the two examples described as authenticated must be regarded as referable with certainty to the horizons of the very early (i.e., ancient) deposits in which they lay. The claims to a corresponding antiquity made on behalf of some other specimens have been combated with more success, and the latter are for this reason separated under the head of doubtful examples. The Trinil and Mauer bones present such extraordinary characters that they can claim an interest of unparalleled kind, but unfortunately the skeletons are represented by small portions only. Both were found in river alluvia, and the lower jaw is the sole portion of the Mauer skeleton so far discovered. The bones bear witness to the former existence of beings to which the very term "human" must be employed with reservation. More particularly is this the case in regard to the Trinil remains. Some of the more important characters of these may now be reviewed. The outstanding feature is that the bones indicate an individual similar in stature (and presumably in weight) to a well-developed modern man. Yet the brain case is extraordinarily deficient in capacity if judged by a human standard, for herein it falls much below the lower limit of variability in modern skulls. The brain case is particularly defective in its vertical diameter (or "height") and in its longitudinal curvature. These defects combined with the lack of width at the temples and the prominence of massive brow ridges provide the strongest possible suggestion of the manner in which the human type was derived from that of an ape.

SERIES	AUTHENTICATED		DOUBTFUL
Earliest Series	*Place*	*Name*	*Skeletons or bones from*
(Early Pleistocene or perhaps late Pliocene)	Trinil (Java) Mauer (Germany)	*Pithecanthropus erectus* * *Homo heidelbergensis* *	Piltdown * Galley Hill * Ipswich * Olmo * Castenedolo * Foxhall * Savona *
Lower Paleolithic Series Chellean	No authenticated skeletal remains		Krapina † (Obermaier) (but see the Middle Paleolithic Series)
Middle Paleolithic Series	La Quina (France) * Le Moustier (France) †		Sipka (Moravia) † Ochos (Moravia) †
Acheulian to Mousterian	La Chapelle-aux-Saints † Neanderthal (Germany) Forbes Quarry (Gibraltar) Spy (Belgium) † Krapina (Croatia) La Naulette (Belgium) † Malarnaud (France) † St. Brelade (Jersey) † La Ferrassie (France) † Pech de l'Aze (France) † Taubach (Germany)		Moulin Quignon (France) Dartford (England) * Bury (England) *
Upper Paleolithic Series Aurignacian	Grotte des Enfants (Mentone) † Cavillon (Mentone) † Barma Grande (Mentone) † Cro-Magnon (Greece) † Paviland (England, So. Wales) †		
Magdalenian	Combe Capelle (France) † Chancelade (France) †		

* From an alluvial deposit.
† Cave deposit.

In spite of this conclusion the Trinil calvaria, or skullcap, presents certain characters which, taken together with those of the thigh bone, constrain the anatomist to range the *Pithecanthropus erectus* on the human side of the zone or space intervening between the forms of man and apes. The Mauer jaw provides material for similar conclusions, for whereas its enormous mass alone suggests the ape, its dentition and some details in the region of the chin proclaim that an advance has been made in the direction of the distinctive human conformation. While it is debatable whether or no the Mauer jawbone is appropriate to such a skull as that from Trinil, it seems probable that the Mauer fossil represents a slight advance in evolution from the stage exemplified by the skeleton from Java.

For the moment it is convenient to defer consideration of the series of doubtful specimens. It must not be supposed that these are to be placed unreservedly out of court, although for the moment they are passed by. Proceeding to the next series of well-authenticated finds, we encounter a group referred to the Middle Paleolithic period of the well-known classification employed by archæologists.

The skeletal remains of Middle Paleolithic antiquity constitute a fairly homogeneous assembly. This may be designated provisionally the type of *Homo primigenius.* The descriptive term is due to Professor Schwalbe, of Strassburg, who has added so much to a proper appreciation of the nature and relations of these fossil forms. The alternative designation of *Homo neanderthalensis* is also employed, chiefly by Professor Boule and his colleagues in France. But although the arguments employed by the latter against the adoption of the term *Homo primigenius* are of no small weight, nevertheless that expression will be employed in the following paragraphs as providing a more generally applicable name for the type in question.

Fragmentary skeletons representing nearly a score of individuals have enabled anatomists to reconstruct with confidence the salient features of this type. The materials come from localities distributed widely over the surface of Europe, viz., from Croatia to the Channel Islands and from the Neanderthal (near Düsseldorf) in north Germany to Gibraltar. The characters presented by the skeleton of *Homo primigenius* may be summarized by the statement that this form is quite definitely and distinctively human, but that nevertheless it occupies a position inferior to all the existing Hominidæ and to all prehistoric representatives of mankind, the Trinil and Mauer fossils alone being excepted, for *Homo primigenius* is superior only to *Pithecanthropus* and to *Homo heidelbergensis.*

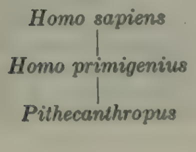
The foregoing statement is justifiable, even though we concede the large amount of brain claimed for at least several examples of this otherwise lowly type. The size of the brain is naturally a matter of inference, but the size of the skull gives reliable information on this point, and it must not be forgotten that *Homo primigenius* seems to have been in some instances even better provided with brain material (if the mere weight be taken as a test) than the average *Homo sapiens* of to-day.

Yet the form of the brain is not to be overlooked, and examination of the brain case shows clearly enough that the lack of vertical height and of curvature in the longitudinal arch of the skull are very characteristic of *Homo primigenius.* These defects or shortcomings are expressive of corresponding features in the brain; they are also reminiscent of the conditions noted above as distinctive of the brain case of *Pithecanthropus* (Trinil). The term "reminiscent" is employed advisedly, for in *Homo primigenius* a distinct advance is observed as having been made from the earlier stage. In a similar way, when the Mauer jaw is brought into comparison, distinct advances on the part of *Homo primigenius* may likewise be detected.

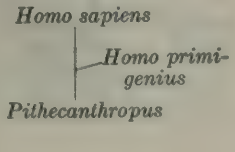
Passing from the skull to other parts of the skeleton, we must note that the distinctions between *Homo primigenius* and *Homo sapiens* are evident in almost every bone so far subjected to examination. Here it will suffice to note that all the indications are in favor of assigning a low stature to *Homo primigenius,* and while this does not serve to distinguish him absolutely from *Homo sapiens,* it would apparently differentiate him from *Pithecanthropus erectus* (with 5 feet, 8 inches of height). Returning to the tabulation given, we pass to the Upper Paleolithic series. In this group the skeletons no longer present the characters of *Homo primigenius,* and it is noteworthy that the latter disappears completely at the end of the Middle Paleolithic period. In most of the instances that follow, no fundamental distinction from European man is to be detected. In exceptional cases, however, the skeletons are said to present somewhat remarkable characters. Thus, two skeletons from Mentone referred to the Aurignacian period are said to possess features allying them to the negro types of Africa. Another skeleton of Aurignacian antiquity (viz., that from Combe-Capelle) has been compared in some details to certain Oceanic (Melanesian) negro types, and the so-called Chancelade skeleton is alleged to resemble the Eskimo type in regard to the proportions of the brain case and the form of the facial bones.

Such suggestions conjure up possibilities of a far-reaching significance in regard to the evolution of racial types and the dispersion of the fully evolved products; but while recognizing these possibilities, we should bear in mind the extraordinarily feeble basis upon which the suggestions are made. Two crania from Mentone (Grotte des Enfants), one from Combe-Capelle, and one from Chancelade are employed to represent three well-marked existing types. The identifications are made on a few points only, not upon a continuous and unmistakable succession of coincidences in conformation, so that until many more crania are available and many more points of identity shall have been demonstrated, these matters are for surmise and suggestion only. With the Upper Paleolithic series this part of the present survey comes to an end. It appears that, on the whole, the evidence of the skeletons described above points to an evolution from forms corresponding to the Trinil and Mauer types onward to that of *Homo primigenius* and thence to that of modern man. It would be misleading to leave the reader to suppose that we have here a direct line of descent and that *Homo heidelbergensis* was directly ancestral to *Homo primigenius,* as the latter was to *Homo sapiens.* Upon such evidence as is available there is good reason to suppose that *Homo primigenius* had diverged in no small degree from an analogous form destined in course of time to provide by evolution the more highly developed *Homo sapiens.* Two alternative points of view of this subject are contrasted by Professor Schwalbe, who illustrates them by means of such schemes as those following (labeled *A* and *B* respectively):

A

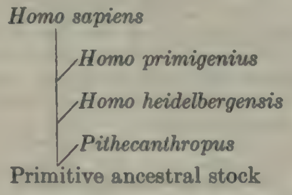


B



Of these schemes, *A* represents what may be termed that of direct ancestry, *B* the mode described above as an alternative; and we may note that Professor Schwalbe himself pronounces in favor of *B.* But yet another possibility exists, for we must not postulate that the form of *Pithecanthropus* discovered at Trinil is that of a direct ancestor. This view may be illustrated also in schematic fashion as in diagram *C.*

C



Thus, *Pithecanthropus, Homo heidelbergensis,* and *Homo primigenius* in turn aid us to realize the appearance of successive ancestral stages, but we may yet identify them with actual ancestors. The distinction may appear too finely drawn, but in such a matter it is of some importance.

Allowance being made for such necessary correction of evidence, these fossil remnants enable us to retrace the course of human evolution to a stage not far removed from that of the anthropoid apes; and in point of time this process appears to extend backward as far as this end of the Pliocene division of the Tertiary period. The course of that evolution agrees in a remarkable manner with that anticipated by evolutionists and in particular by Huxley. We may note that the change in the absolute size or mass of the body is not great, and thus the suggestion has gained ground to the effect that the Hominidæ are derived from what are known as "giant forms" among their congeners the Primates.

The bones of the limbs and trunk do not as yet provide such definite information as might have been expected; for though these parts in the ancient skeletons possess many characters suggestive of a lowly origin, yet the bones are quite definitely those of mankind and not those of apes. Thus, the thigh bone of *Pithecanthropus erectus* is far more human than the skullcap of that form. Again, when the limb bones of *Homo primigenius* are called in question, the conformation of the foot (though not without peculiarities) does not provide evidence that the foot was really prehensile. The power of prehension still exists in a small degree, but it does not appear that *Homo primigenius* greatly excelled some of the existing human types in that respect. For the rest, there are certain features of the ribs and some bones of the hand which indicate that *Homo primigenius* had progressed along a line of development upon which the real ancestors of *Homo sapiens* may have never entered. Nevertheless, distinctive features have thereby been imprinted upon the skeleton of *Homo primigenius,* and they are probably not relevant at all in regard to the evolution of mankind in general.

Thus we are led to consider the skull and the general trend of the evidence provided by this part of the skeleton. First, the diminution in size of the jaws and teeth may be mentioned. Concurrently with this diminution an increase in the capacity of the brain case is remarked, but in regard to the last-mentioned feature a very curious irregularity of increase has been recorded. Thus, the skull of *Pithecanthropus* was undoubtedly of small capacity (of the skull of *Homo heidelbergensis* nothing apart from the lower jaw is known). The irregularity mentioned above appears when the various examples of *Homo primigenius* are considered. Among these the examples from Forbes Quarry (Gibraltar) and La Quina (France) have brain cases of very small capacity when judged by the standard of *Homo sapiens*, though markedly in excess of the figure quoted for *Pithecanthropus;* but other examples of *Homo primigenius* surpass in point of skull capacity (and consequently of brain mass) most of the more highly developed modern types of *Homo sapiens*. Indeed, if the crania from the Neanderthal, La Chapelle-aux-Saints, and Le Moustier be employed to provide an average value for skull capacity in cubic centimeters, there are few modern races of Hominidæ capable of furnishing a higher figure. Yet the skull enables the anatomist to obtain some little information as to the form of the brain as well as its size and probable weight; and by making a cast of the interior of the skull, the dimensions and proportions of the brain can be determined. Such researches have been made recently by Professors Boule and Anthony at Paris. They examined brain casts of the small-brained skull from La Quina and also of the megacephalic cranium from La Chapelle-aux-Saints. In both a like evidence of a lower status was found in regard to the actual form of the brain as distinguished from its size. One of the most distinctive features is the relatively flattened form of the brain as a whole. In other words, the vertical diameter is small, and the longitudinal arc is much less boldly curved than in the modern type of brain. The same feature has been noted already in reference to the cranial curvature and vertical dimensions, and the skulls and brain casts alike indicate that the brain developed in length and breadth before attaining its present stage in point of height.

Whether the human brain can claim priority in evolution over the changes in the skeleton, rendering possible the erect attitude, is a problem not yet solved—at least there is not yet a general agreement on this point; but on the whole the considerations urged in favor of an increase in the brain as the primary step appear to outweigh the objections to that view. Such a summary of the present position in regard to the mode of human evolution might suffice were the specimens ranged under the heading "authenticated" in the tabulation all that the anthropologist had at his disposal. Such is not the case, and reference to the doubtful instances is necessary since, should they be authenticated, very distinct qualifications would be necessitated in the account of man's origin as set forth above. The specimens now to be considered are divisible into two groups, or rather the Piltdown fragments stand in strong contrast to all the rest. The latter do not differ essentially from modern human skeletons, but they are not wholly deprived of interest on that account, for to some of them an antiquity equal to that of the Mauer or Trinil bones has been assigned. If the type of *Homo sapiens* can really claim such antiquity, the ancestral forms must be sought in earlier periods and strata than any mentioned hitherto in this article. *Pithecanthropus*, *Homo heidelbergensis*, and *Homo primigenius* would still be regarded as reminiscent of some of those ancestral stages, but they would then appear as remnants persistent long after their particular stage had been passed through by *Homo sapiens.* We may remark at once that in the earlier strata thus brought into consideration, nothing so suggestive of the immediate evolution of man has yet been found to compare with the Trinil and Mauer fossils.

The periods antecedent to the Pliocene divisions of Tertiary time are termed Miocene, Oligocene, and Eocene respectively, the Eocene being the oldest. If the fully evolved *Homo sapiens* existed in the Pliocene epoch, then the ancestral stages corresponding to *Homo primigenius* and the like might be expected in the Miocene epoch or even earlier. It is then at least conceivable that eventually the existence of Eocene man may be demonstrated by the discovery of unequivocal evidence of his presence in Eocene deposits. Archæologists who follow Professor Rutot, of Brussels, claim acceptance of the proposition, on the ground that human artifacts have been discovered in Eocene and under circumstances testifying to the similarity in age of the implements and their immediate surroundings. This is, however, the extreme case, and though implements of such vast antiquity are said to be forthcoming, no human bones have yet been assigned to any deposits earlier than the latest of the Pliocene series.

Under the circumstances it is possible to adopt only a noncommittal attitude and to express the view that possibilities and not certainties are thus indicated. Moreover, as the specimens do not differ in any important details from the bones of modern men, they provide no anatomical evidence on the problem of human evolution.

We turn now to the one remaining instance, viz., the fragments of a skull from Piltdown in Sussex, England. They consist of portions of a skull of which a part came some years ago into the hands of Mr. Dawson, of Lewes. The skull has been reconstructed, and from its peculiarities it has received the distinctive name *Eoanthropus*.

Eoanthropus dawsoni is thus represented by parts of a skull only. No parts of the limbs are known, so that the information provided by them in regard to stature and bulk is lacking. The skull fragments were recovered from an ancient gravel deposit. They are completely mineralized. Estimates of their antiquity are divided between the later Pliocene epoch and the early Paleolithic division of Post-Pliocene time. It is perhaps significant that these alternative estimated are ranged, one earlier than and the other later than that given for the Trinil and Mauer fossils. In either case they are assigned to an earlier period than that of *Homo primigenius.*

But the fragments possess an overwhelming interest quite apart from their antiquity. This interest is concentrated about two points. The first of these is that, according to Professors Elliot Smith and Smith Woodward, *Eoanthropus* had a small brain and in the conformation of the brain agreed with the Gibraltar (Forbes Quarry) and La Quina representatives of *Homo primigenius.* The thickness of the skull is another feature of agreement, but the skull of *Eoanthropus* even surpasses that of *Homo primigenius* in this respect. Yet the brow region of the skull is in *Eoanthropus* more suggestive of the modern-type man of *Homo primigenius*, and the temporal bone is also in important respects similar to those of modern skulls.

The second point is that the lower jaw makes a closer approach to the form characteristic of apes than does any other specimen, even that of *Homo heidelbergensis.* The Mauer jaw is accordingly displaced from the position of distinction, if not of eminence, formerly occupied by it.

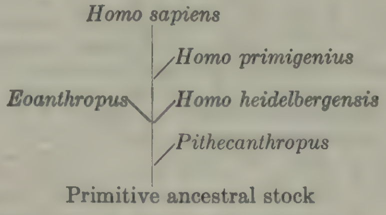
Not only is the lower jaw of *Eoanthropus* remarkably pithecoid in form, but a canine tooth of quite extraordinary size and length was found in the same gravel bed. Though found at a later date, this tooth is said to be appropriate to the jaw, and it enhances the ape-like character of the latter. Yet the lower jaw is so inappropriate to the temporal bone of the skull with which it articulates that, but for the proximity of the two as regards the locality of discovery, it is probable that the jaw and skull fragments would not be referred to the same type, much less to one and the same individual. So extraordinary a combination of characters is met with in no other instance, and it is for future discoveries to confirm or modify the correctness of the association of these fragments as parts of a single skeleton.

The combination has been questioned by some authorities of repute. As regards the brain case itself, the first reconstruction prepared by Dr. Smith Woodward has been modified, with consequent alteration of the volume of the brain. (It is impossible to state whether the volume has been increased or decreased, for diametrically opposed opinions are held on this point. On the whole it is probable that a slight increase has been effected.) Even so, the reconstructed skull is to be strongly contrasted with the reconstructions prepared by other observers. Some of the latter assign not a small, but a very considerable, cranial capacity to *Eoanthropus*, and in particular they provide it with a well-arched brain case contrasted with the flattened form given it by Dr. Smith Woodward. Although the matter is still under discussion, the balance of evidence for the moment inclines to the side of Dr. Smith Woodward. *Eoanthropus* is thus regarded as possessing a small brain case, inclosing a brain differing in some essential features from that typical of *Homo primigenius.* The size of the brain is a point of similarity (as remarked above). The facial skeleton of *Eoanthropus* must have been markedly prognathous, while the large canine teeth contributed largely to a quite peculiar physiognomy; but on the whole the stage of evolution is inferior to that of *Homo primigenius.*

If we inquire into the bearing of *Eoanthropus* on the evolution of man, we find that the brain and the brain case made an earlier advance than the face, and more particularly the lower jaw. The differences between the lower jaw in *Eoanthropus* and *Homo heidelbergensis* (Mauer) suggest that these examples represent alternative and perhaps parallel lines of evolution. The scheme of genealogical descent must therefore be modified accordingly, and diagram *C* of a preceding page may now be replaced by another, *D* (see diagram *D*).

The exact point of divergence of *Eoanthropus* is a matter of speculation, for if the lower jaw is more lowly than that of *Homo heidelbergensis*, the brain cast of *Eoanthropus* shows one character at least of high developmental significance. That character is the lack of symmetry between the right and left halves of the brain. In the apes the two halves of the brain are as nearly symmetrical as possible. In *Homo sapiens* there is a marked difference, hitherto regarded as essentially distinctive of the highest types of brain (the brain case follows the brain in this detail). Right-handedness and the concentration of the mechanism of speech on one side of the brain are said to be related to this asymmetry. But in *Eoanthropus* the difference is as marked as in any modern example, and this consequently lifts *Eoanthropus* high in the scale of evolution. Consequently, even if the point of departure be placed below that of *Homo heidelbergensis* (as in diagram *D*), the line culminating in *Eoanthropus* must be made to ascend steeply and to terminate just below the level of *Homo primigenius.*

D



Lastly, the probable antiquity of the Piltdown fragments must be recalled in this connection. The lowest estimate of that antiquity approximates *Eoanthropus* to *Homo heidelbergensis.* The higher estimates make *Eoanthropus* rather older than the Mauer fossil. (But it is noteworthy that the advocates of that higher estimate claimed that *Eoanthropus* was not very different from modern men and that the Piltdown fragments do, in fact, demonstrate the existence of Pliocene man in a stage of evolution not very different from that of *Homo sapiens.*) However this may be, the presence of *Eoanthropus* does not essentially modify the account of human evolution suggested in an earlier paragraph, though difficulties are encountered in regard to details. The Trinil form (*Pithecanthropus*) would show that in the later Pliocene epoch the ancestral stages can scarcely be regarded as human, and they suggest that earlier Pliocene ancestors would, if forthcoming, be ranked as highly developed apes rather than the lowliest of human beings. In fact, at a certain stage the discrimination becomes as difficult as that of various shades in the spectrum of white light.

Such a view of the origin of man is better founded than the alternative of referring these events to a much earlier part of Pliocene time or even to the Miocene epoch. Yet the alternative must not be overlooked in view of the very different interpretation placed by some authorities on the Piltdown fragments and other specimens included in the list of doubtful cases, and even those who accept the account given here must surely find some difficulty in reconciling complacently the lower jaw with the skull fragments of *Eoanthropus.* Future discoveries may provide the solution of the difficulty. They may prove that *Homo sapiens* existed in the *Pliocene* epoch; they may necessitate a wholesale revision of the foregoing account and show that *Homo sapiens* arose suddenly as a mutation from some quite lowly form, a form, that is to say, less highly evolved than *Pithecanthropus*. The latter, together with *Homo heidelbergensis* and *Homo primigenius*, would then appear as specialized offshoots from the stock of *Homo sapiens*, modified so far as to demand distinction of a specific order.

But if we deal with the actual materials at hand, we must adopt the view of evolution set forth above. In regard to the stages of human evolution antecedent to that represented by *Pithecanthropus*, some advances in knowledge have been made recently, but much remains to be done. Of the relevant discoveries, those made in India and in Egypt deserve special mention. The officers of the Geological Survey of India have added several fossil forms to the stock of extinct anthropoid apes, but these are mostly of the type of the larger existing varieties, such as gorilla, chimpanzee, and orang-utan. While the new fossils contribute to a general knowledge of those apes, they do not provide any definite information regarding the ancestry of those animals and of man. In point of time they are of Pliocene antiquity.

The discovery of a fossil anthropoid ape in Eocene deposits in Egypt (Fayum) is much more significant. Although the form in question is referable to the *Hylobates* group, the lowliest of the anthropoid apes, it is important as showing the rapidity of evolution of those animals. Thus, although the evidence does not admit of the drawing up of a definite pedigree, the specimens testify to the probability that in human evolution the stage of *Pithecanthropus* was preceded by a chimpanzee stage probably of Miocene antiquity, and this by a stage corresponding to the gibbon, or *Hylobates,* to which Eocene antiquity must be assigned. But the Eocene epoch provides still lower forms down to the very rootstock of the apes and other mammals. This consideration leads to the inference that at that early epoch evolution was proceeding with great rapidity; and this conclusion is justifiable, even though the vast duration of Eocene time be admitted. All recent discoveries and investigations confirm the conclusion that the great distinctive character of man—viz., the brain—has provided the determining factor throughout the course of progress from the earliest mammalian stage onward.

BRIEF NOTES ON SOME OF THE MORE NOTEWORTHY EXAMPLES INCLUDED IN THE TABULATED STATEMENT

1. *Trinil (Java)*.—The discoveries were made by Professor Dubois in the years 1891 and 1892. They consist of the upper part of the skull, a small fragment of a lower jaw, three teeth, and a left thigh bone. Professor Dubois believes that all the fragments are to be referred to one skeleton. The latter is ascribed to a form intermediate between the highest apes and man. The thigh bone is taken to indicate that the erect attitude had been attained. The name *Pithecanthropus erectus* was devised by Professor Dubois and has been accepted even by those who reject the claims to an intermediate position in evolution made on behalf of this example.

Objections to the conclusions of Professor Dubois have been based upon various considerations. The distance (about 46 feet) between the thigh bone and the skullcap (as they lay in the alluvial river deposit which yielded them) has been considered too great to allow of the association of the two fragments. The latter have been referred by some authors to a very highly developed ape, by others to an exceedingly low human type. The age of the strata in which they were discovered is also in dispute. Professor Dubois regarded this as of Pliocene antiquity, but strong claims are made for assigning it to the following Pleistocene period. No implements were found by Dubois. The nature of these fossils is therefore not entirely beyond dispute, and they illustrate clearly the difficulties encountered in dealing with fossils discovered in alluvial deposits. Consult Eugène Dubois, *Pithecanthropus erectus, Eine menschenähnliche Uebergangsform aus Java* (Batavia, 1894), translated in *Smithsonian Institution, Annual Report, 1898* (Washington, 1899).

2. *Mauer (near Heidelberg, Germany)*.—A single lower jaw, discovered in 1908. The discovery was made by a workman employed by the late Dr. Schoetensack. The jaw lay in a sandy deposit, beneath about 70 feet of superincumbent strata. The latter included both the older and newer loess deposits of the Rhine alluvial, and their presence aids in the solution of the problem of dating the jaw. This is referable to the very earliest Pleistocene period. It is extremely massive, and though in this respect it recalls the form of the jaw in a gorilla or a large orang-utan, it is clearly not to be identified with either of these forms. The chin is retreating, but characteristic human depressions are found beneath it. The teeth are relatively much smaller than one would expect in a lower jaw of such large size. On the whole, the human characters are predominant, so that Dr. Schoetensack named the form thus represented *Homo heidelbergensis*. No other part of the skeleton was found. The succession of the strata as described above, and the characters of other fossil animals found on the same horizon as the

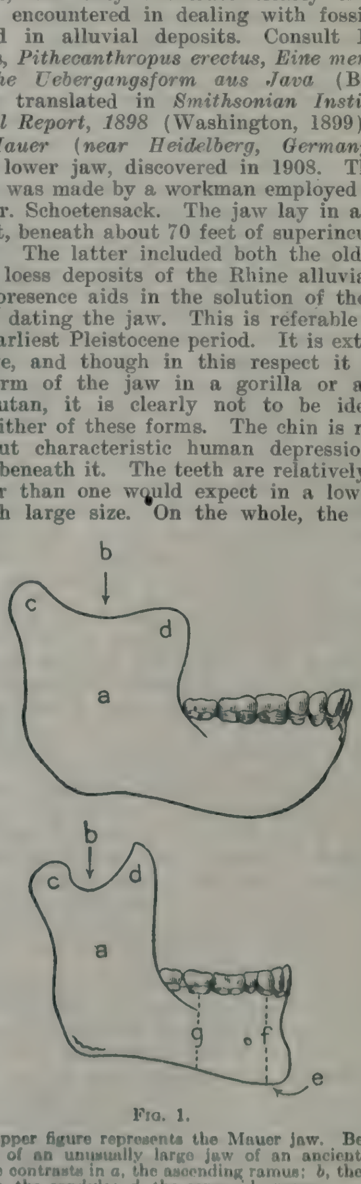


FIG. 1.

The upper figure represents the Mauer jaw. Below is a drawing of an unusually large jaw of an ancient Briton. Note the contrasts in *a*, the ascending ramus; *b*, the sigmoid notch; *c*, the condyle; *d*, the coronoid process.

Mauer jaw, form the basis for the conclusion as to its antiquity. No implements or other artifacts were found. Consult Otto Schoetensack, *Der Unterkiefer des Homo heidelbergensis* (Leipzig, 1908).

3. *Piltdown* (*Sussex, England*).—In this locality several fragments of bones were recovered from a gravel deposit by Dr. Smith Woodward and Mr. Dawson. The discoveries extend over a period of several years, but the fragments seem to have been concentrated within a comparatively limited area. They comprise a number of pieces of a skull, and these have been associated by the above-mentioned authors, who designated the form discovered by them *Eoanthropus dawsoni.* The skullcap is represented by three pieces of very great thickness. Part of the lower jaw, a canine tooth, part of a nasal bone and of one of the bones from the nasal cavity complete the list. The gravel contained other mammalian fossils, including portions of the teeth of a *Stegodon* (a Pliocene form of elephant), hippopotamus, rhinoceros, *Cervus*, and a beaver. Taking the latest of these animals as a guide to the antiquity of the deposit, the latter is assigned to the earliest Pleistocene period. It is thus not far removed from the deposit which yielded the jaw referred to *Homo heidelbergensis.* Flint implements were found at Piltdown, but cannot be regarded as a reliable means of dating the bones. Much discussion has taken place since the first publication (in 1912) of an account of this find, and objection has been taken chiefly to the mode of reconstruction of the skull as first exhibited. Some authorities doubt the correctness of associating the various fragments as parts of one skeleton. Consult Dawson and Smith Woodward, "The Piltdown Man," in *Quarterly Journal of the Geological Society*, vol. lxix (London, 1913). Prof. J. H. McGregor, of Columbia University, has made an independent study of these finds and has restored the missing parts as shown in Fig. 2.

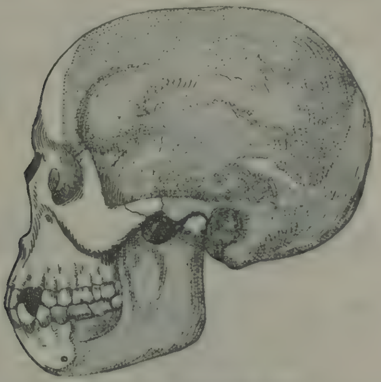


FIG. 2. THE PILTDOWN SKULL.

Eoanthropus (*Homo*) *dawsoni*, Woodward, as restored by McGregor. Drawing one-fourth actual size. Darker portions are parts actually known, lighter parts restored. In lower jaw the darker part is known on the right side.

4. *Galley Hill* (*Northfleet, Kent, England*).—This locality gives its name to a human skeleton discovered in a gravel pit in the year 1888, but not described scientifically until 1895. Many parts of the skeleton were preserved. With the exception of some features of inferiority in the lower jaw and possibly in the teeth, the bones of this skeleton tally exactly with those of existing Europeans. The skull is much distorted, probably through pressure. The conditions under which the bones were collected do not warrant the very important step of assigning this skeleton to the early epoch (in the Pleistocene) at which the gravel bed was deposited. Consult E. T. Newton, "On a Human Skull and Limb Bones Found in the Palæolithic Terrace-Gravel at Galley-Hill, Kent," in *Quarterly Journal of the Geological Society*, vol. li (London, 1895), and for recent criticism, W. L. H. Duckworth, in *Essays and Studies Presented to William Ridgeway* (Cambridge, 1913).

5. *Ipswich.*—A human skeleton found about 4 feet beneath the surface. The skeleton was in a contracted attitude and lay beneath bowlder clay just where this rested upon an underlying sandy stratum. The discovery was made by workmen in the employment of Mr. Moir, of Ipswich. Mr. Moir believes that the skeleton was placed in situ before the deposition of the bowlder clay, and that it represents a human being of greater antiquity than that deposit. The skeleton is of a modern type, but a shin bone which has been preserved is curiously formed, having an oval instead of a triangular section near its mid-point.

The contracted attitude suggests a neolithic interment, but Mr. Moir urges strongly that no evidence of disturbance of the soil could be detected above the skeleton.

From the geological side objections are raised to the effect that the superincumbent clay is not the real bowlder clay as originally deposited, but a wash from the real bowlder clay which is admittedly close by the site on which the skeleton was found. Such a wash may contain all the constituents of the parent deposit, but yet own a much more recent date.

On the whole, it will be discreet not to accept the authenticity of the Ipswich sub-bowlder clay without a great deal more direct evidence than is available at present. Consult Moir and Keith, "Account of the Discovery and Characters of a Human Skeleton Found beneath a Stratum of Chalky Boulder Clay near Ispwich," in *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, vol. xlii (London, 1912).

6. *Olmo.*—A small town in the Val d'Arno (Tuscany) has provided a name for a human skull found in a railway cutting and 50 feet below the surface. The discovery was made in 1863. The associated fossil animals indicate a Pliocene antiquity of the strata. The skull is much elongated, but is of the modern human type. A good cast may be seen in the Museum of Prehistoric Archæology, Château Saint-Germain, Paris. The original is at Florence. The evidence concerning the position and surroundings of this skull is not sufficiently precise to justify its acceptance as a well-authenticated case of an early human fossil. Consult A. H. Keane, *Ethnology* (2d ed., Cambridge, 1896; reprinted, 1901).

7. *Castenedolo* (*Italy*).—Remains of four individuals from strata of undoubted Tertiary antiquity. Though the Italian anthropologist Sergi stoutly defends the claims of the human bones to a similar antiquity, and though his French colleague De Quatrefages admitted the association, the evidence does not seem to be conclusive. All the skeletons are of the modern type. Consult A. H. Keane, *Ethnology* (2d ed., Cambridge, 1896; reprinted, 1901).

8. *Foxhall.*—A human lower jaw, from a coprolite pit at Foxhall in Suffolk. The condition of the specimen suggested great antiquity, but conclusive evidence is lacking. The specimen is of the modern type. Consult R. H. Collyer, "Fossil Human Jaw from Suffolk," in *Anthropological Review*, vol. v (London, 1867).

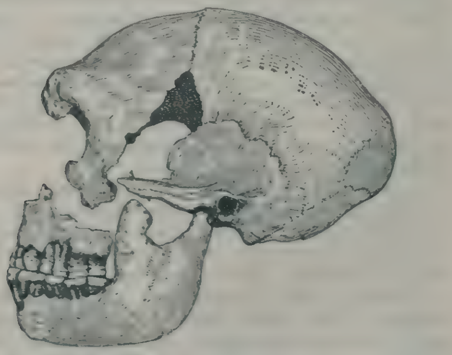


FIG. 3. THE SKULL RECOVERED WITH SKELETON, 1911, FROM LA QUINA, CHARENTE, FRANCE.

9. *Savona.*—A fragmentary human lower jaw of modern type from a Pliocene deposit at Savona in Italy. Conclusive evidence of the great antiquity of this fragment is lacking. Consult Arturo Issel, "Résumé des recherches concernant l'ancienneté de l'homme en Ligurie," in *Congrès International d'Anthropologie et d'Archéologie Préhistoriques*, vol. i (Paris, 1868).

10. *La Quina* (*France*).—This site is very extensive, and it has yielded remains of about nine individuals, most of these being represented by small fragments of their skeleton only; but in September, 1911, Dr. Henri Martin, who is excavating the site, came upon a nearly complete skeleton. This is referred to in publications as H 5 and, speaking generally, it is to be understood that H 5 is indicated where mention is made of La Quina.

The photograph gives a good idea of the skull of an example of *Homo primigenius*. The question of the sex of the individual is still in doubt, though it is more probably female.

Figures 4 and 5 illustrate the methods employed in comparing various skull forms. Thus, in Fig. 4 an outline tracing from the La Quina skull is compared with similar tracings from the *Pithecanthropus* (where the cranial arc is even less developed) and a modern Arab skull, which shows the enormous advance in the evolution of the modern brain case and the vaulting of the skullcap. Besides the skeleton designated H 5, the site at La Quina furnished a very well-preserved half a mandible of *Homo primigenius*. The occurrence of the latter in deposits referred to the end of the Mousterian period is important inasmuch as it illustrates, or helps to illustrate, the range in time of this particular type. The skeleton and skull described above are of much earlier date, though still Mousterian. Consult various publications by Dr. H. Martin, especially in *Bulletin de la Société Préhistorique de France* (Le Mans, 1911), and R. Anthony, "L'Encéphale de l'homme fossile de La Quina," in *Société d'Anthropologie de Paris, Bulletin et Mémoire*, vol. iv (6th series, Paris, 1913).

In conclusion it should be noted that no evidence exists to show that the skeleton at La Quina had been interred. The circumstances suggest that the individual was drowned, for the bones lay in a fine silt deposit, apparently once the bed of a stream.

11. *Le Moustier* (*France*).—A human skeleton discovered in the lower rock shelter of Le Moustier (Dordogne, France). The find was made by Professor Hauser, and the skeleton has been distinguished as *Homo mousterensis hauseri*. The individual was miniature (16 to 19 years of age) and had been interred. The bones were very fragile, but from measurements of these a stature of about 4 feet, 11 inches has been inferred. The skull is of the type of *Homo primigenius* and of large capacity, though this was at first greatly overestimated. The mandible in particular confirms the association of *Homo mousterensis hauseri* with other specimens of the species *Homo primigenius*. Further confirmation is provided by the limb bones. Consult Klaatsch and Hauser, "Homo mousterensis hauseri," in *Archiv für Anthropologie*, vol. xxxv (Brunswick, 1909).

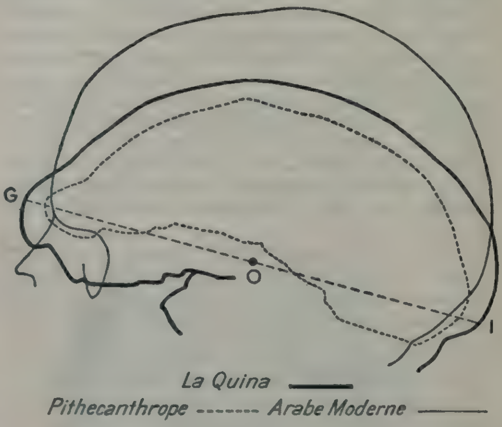


FIG. 4.

Outline tracing of the La Quina skull compared with corresponding tracings from the calvaria of *Pithecanthropus*, and an Arab skull of modern date.

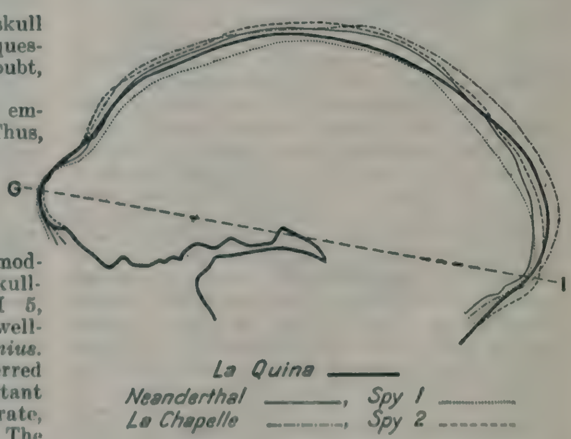


FIG. 5.

Outline tracings to show the concordance in form of the La Quina skull and other examples of *Homo primigenius*.

12. *La Chapelle-aux-Saints* (*France*).—The

skeleton from La Chapelle-aux-Saints is, on the whole, the most complete of all those that are referable to *Homo primigenius*. The body had been interred, and at the time of its discovery in 1908 this was the only example of *Homo primigenius* in regard to which the precise antiquity of the type and the current mode of disposal of the dead could be demonstrated. The skeleton lay on its back in a slight depression. This had been sunk in the floor of a very low cave. Stone implements were found near the bones, with which they are supposed to have been interred. The chief characters of the skeleton have been described incidentally earlier in this article, for the completeness of the skeleton at La Chapelle-aux-Saints makes it the standard to which other more fragmentary remains are to be referred. To take a single instance for illustration, the similarity in respect of the curve of the brain case in the skulls from La Chapelle-aux-Saints, La Quina, and in other examples of *Homo primigenius* may be selected. The closeness of the resemblance in this respect may be understood easily from the comparison of the tracings grouped together in Fig. 5, page 756 (in connection with the notes on the La Quina skeleton). Consult Marcelin Boule, "L'Homme fossile de la Chapelle aux Saints," in *Annales de Paléontologie* (Paris, 1911–13), and G. Schwalbe, "Kritische Besprechung von Boule's Werk mit Eigenen Untersuchungen," *Separatabdruck aus der Zeitschrift für Morphologie und Anthropologie*, vol. xvi (Stuttgart, 1914).

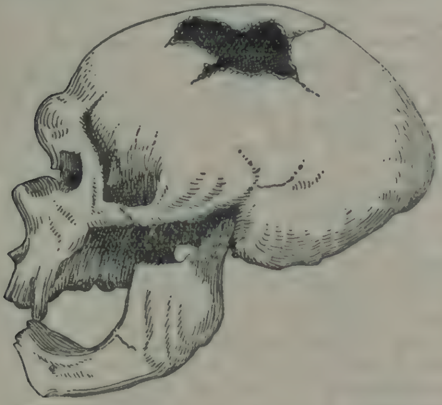


FIG. 6. SKULL FROM LA CHAPELLE-AUX-SAINTS.

13. *Neanderthal* (*Germany*).—A fragmentary skeleton found in a cave (the small "Feldhofer Grotte") in the year 1856. The bones were not seen in situ, but there are some indications that this instance was one of an interment similar to that at La Chapelle-aux-Saints.

The problem of the Neanderthal man has excited attention and aroused controversy for nearly half a century. The earlier work of Schaaffhausen, excellent though it was, needed revision, which was admirably furnished by Professor Schwalbe in 1901; but the value of the specimen and of the descriptions has been increased again since the latter date by the discovery of the other skeleton here described. It goes without saying that the skeleton of the Neanderthal man is typical of *Homo primigenius*, for which form *Homo neanderthalensis* is a synonym. Unfortunately no parts of the face or lower jaw of the Neanderthal skeleton were preserved. The skull is of considerable capacity, very thick-walled, and distinguished by the heavy brow ridges and the receding frontal bone so frequently mentioned above. The limb bones are remarkably massive, with large articular ends, and the shaft of the thigh bone is somewhat distinctly curved. Consult D. Schaaffhausen, "On the Crania of the Most Ancient Races of Men," in *Natural History Review*, vol. i (London, 1861), and G. Schwalbe, "Der Neanderthalschadel," in *Bonner Jahrbucher* (Bonn, 1901).

14. *Forbes Quarry* (*Gibraltar*).—An imperfect human skull discovered in Forbes Quarry by Lieutenant Flint in the year 1848. This is the earliest discovery on record of a skull of the type of *Homo primigenius*, but its interest was quite ignored until 1864, when the specimen was seen (in the museum at Gibraltar) by Dr. Busk. No detailed description appeared until 1907, when Professor Sollas, of Oxford, investigated the characters of the face and the base of the skull. These parts were lacking in the Neanderthal specimen, and at that date the more perfect specimens from La Quina and La Chapelle-aux-Saints were still undiscovered.

Among the numerous important details upon which the Forbes Quarry skull provides information, the small size of the brain case deserves special mention. So marked is this inferiority when the skull is compared with that from La Chapelle-aux-Saints that it has been suggested that the Forbes Quarry skull is of an earlier type than *Homo primigenius*. But the discovery of the La Quina skull (also of small capacity), and the reflection that these small skulls may be those of female examples, lead to the conclusion that they are best retained as of the type of *Homo primigenius*, until better evidence to the contrary effect has been obtained. Practically nothing is known as to the surroundings of the Forbes Quarry skull when found, nor are any other parts of this skeleton preserved. Consult W. J. Sollas, "On the Cranial and Facial Characters of the Neanderthal Race," in *Philosophical Transactions of the Royal Society*, vol. cxcix (series B, London, 1907), and G. L. Sera, "Sul significato della platicefalia con speciale considerazione della razzi di Neanderthal," in *Archivio per l'Anthropologia e per la Ethnologia*, vol. xl (Florence, 1910).

15. *Spy* (*Belgium*).—Fragmentary remains of two skeletons found in a cave in the year 1886. Portions of the skullcap were found, as were also some parts of the facial skeleton of the individual distinguished as Spy No. 1. The skeletons are referable to the type of *Homo primigenius*, but some slight deviations have been remarked. These differences may be, perhaps, significant in view of the fact that the Spy skeletons are referred to a somewhat later period than the typical examples of *Homo primigenius*. Consult Fraipont and Lohest, *Archives de Biologie*, vol. vii (1887).

16. *Krapina* (*Croatia*).—A very remarkable collection of fragmentary skeletons found in a rock shelter on the bank of the river Krapinica in Croatia. The first specimens were discovered in 1899, but Prof. G. Kramberger continued work for some five or six seasons before exhausting the deposit. The large number of individuals and the extremely fragmentary character of the bones, together with the presence of very primitive implements and remains of *Rhinoceros mercki*, confer a most peculiar and mysterious

character on the Krapina rock shelter. Not less impressive is the occurrence of several human types or at least varieties. Thus, it is claimed that while some of the bones are clearly referable to *Homo primigenius*, yet these are not all alike, and it is said that they include specimens necessitating the recognition of a special variety (viz., *Krapinensis*) of that type. The other examples resemble the specimens found at Spy; but again, certain long, slender limb bones were found. The length and proportions of these do not accord with the standard examples of *Homo primigenius*, and it is suggested that at Krapina the skeletons of *Homo primigenius* and the more highly developed *Homo sapiens* are intermixed. Such an association would be more intelligible if the antiquity of the contents of the Krapina rock shelter were proved to be less than that assigned to the Neanderthal and La Chapelle skeletons, for in that event Krapina might provide evidence of an early contact of two types, of which one above (*Homo sapiens*) was destined to survive; but the evidence of the stone implements (and of the rhinoceros bones) is entirely against any attempt to assign such relatively late antiquity to the human remains. Thus, the Krapina rock shelter has provided a problem which cannot be solved satisfactorily at present.

A point worth mentioning is the curious conformation of some of the teeth found at Krapina. A very great number of teeth were obtained. Those in question are molar teeth, and their peculiarity resides in the fusion of their roots. Such fusion gives a very distinctive character to the tooth in which it occurs, and the interest is enhanced by the discovery of similar teeth in a cave in Jersey (St. Brelade), together with implements and animal remains assigning the human remnants to Mousterian antiquity. Consult G. Kramberger, *Der paläolithische Mensch von Krapina* (Wiesbaden, 1906).

17. *La Naulette* (*Belgium*).—A lower jaw found in a cave in Belgium in or about the year 1866. At the time of its discovery it was regarded as the most pithecoid human fossil then known; in fact, some authorities described it as part of the skull of an ape. In this way the Naulette jaw provided a basis for controversies which are still of interest in relation to the analogous instances of the Mauer and Piltdown lower jaws.

At the present time the Naulette jaw is regarded definitely as exemplifying the type of *Homo primigenius;* but though relatively stout, the jaw is smaller than some of those from Krapina and than the jaw of the skeleton from La Chapelle-aux-Saints. The remarks made in connection with the small capacity of the Forbes Quarry skull are relevant in this connection also. Consult C. C. Blake, "On a Human Jaw from the Cave of La Naulette," in *Anthropological Review*, vol. v (London, 1867), and Otto Walkhoff, "Die diluvialen menschlichen Kilfer Belgiens," in Emil Selenka, *Studien*, part ii (Wiesbaden, 1903).

18. *Malarnaud* (*France*).—An imperfect human jaw found in 1888. In general form the Malarnaud jaw closely resembles that from La Naulette and does not demand any detailed description. A point of interest is found in the fact that the Malarnaud jaw lacks the sockets for one of the front (incisor) teeth. This suggests that the tooth had been lost at an early date, perhaps by artificial interference. This suggestion is based on the analogous case of the lower jaw of the Galley Hill skeleton. In the latter instance Mr. Jackson considers that evidence is present of the custom of artificial removal of teeth and of the antiquity of this rite, now found in certain savage tribes only. Consult Malarnaud Filhol, *Bulletin de la Société d'Anthropologie de Paris* (Paris, 1888).

19. *St. Brelade* (*Jersey*).—The human remains thus designated come from a cave in Jersey, where they were accompanied by implements and animal remains referable to the Mousterian epoch. The only point deserving of notice is the occurrence of teeth with fused roots and resembling those found previously in the rock shelter at Krapina only. In this instance the teeth suffice to indicate the former presence (in the Jersey cave) of *Homo primigenius*. Consult R. R. Marett, "Pleistocene Man in Jersey," in *Archæologia*, vols. xii, xiii (2d series, Oxford, 1911–12), and Keith and Knowles, "Description of Teeth of Palæolithic Man from Jersey," in *Journal of Anatomy and Physiology*, vol. xvi (London, 1911).

20. *La Ferrassie* (*France*).—A human skeleton was found in a rock shelter in this locality during the autumn of 1909 by M. Peyrony. The bones were so placed as to indicate that an interment had taken place. Subsequently the fall of blocks of stone from the roof of the shelter had damaged the skeleton greatly. The bones were transported to Paris and have since been very carefully disengaged. When restored this skeleton will add another important document to the list of those illustrating the osteology of *Homo primigenius*. No detailed account is as yet available. It should be added that the excavation of this rock shelter at La Ferrassie has yielded evidence of the most precise kind regarding the succession and superposition of paleolithic deposits from the Acheulian stage onward. Consult Capitan and Peyrony, in "Deux squelettes humains au milieu de foyers de l'époque mousterienne," in *Bulletin de la Société d'Anthropologie de Paris*, vol. i (6th series, Paris, 1910).

21. *Pech de l'Aze* (*France*).—This locality yielded to the excavation of M. Peyrony the skull of a child referable to the period and presumably to the type of *Homo primigenius*. No detailed description is accessible to the present writer, but an excellent description of a young skeleton of *Homo primigenius* has been provided by Herr Hillebrand, who points out several distinctive features even in immature representatives of this ancient human type. Consult Hillebrand, in *Congrès International d'Anthropologie et d'Archéologie Préhistoriques* (Geneva, 1912), and reference under La Ferrassie above.

22. *Taubach* (*Saxe-Weimar, Germany*).—From this region two human molar teeth of unusual form were obtained in 1895. One of these teeth is a "milk" molar, chiefly remarkable on account of its large dimensions. The other tooth is a molar of the permanent series and is distinguished rather by its form and proportions. These are remarkably pithecoid, but the evidence is not of great weight at present, though it indicates that the site at Taubach may at any time yield human fossil remains of an interest comparable even to that provided by the Mauer jaw. Consult Nehring, in *Zeitschrift für Ethnologie* (Berlin, 1895).

23. *Sipka or Schipka* (*Moravia*).—A frag-

mentary human lower jaw. It is referable to the type of *Homo primigenius.* Consult Otto Walkhoff, in Emil Selenka, *Studien,* part ii (Wiesbaden, 1903), and Obermaier, "Quaternary Human Remains in Central Europe," in *Smithsonian Institution, Annual Report, 1906* (Washington, 1907).

24. *Ochoz* (*Moravia*).—The authenticity of the lower jaw from Ochoz was regarded as insufficient by Obermaier (op. cit.; cf. Sipka above). Nevertheless the specimen is accepted as of the type of *Homo primigenius* by so careful an authority as Schwalbe, but nothing is known of the circumstances under which the find was made (Obermaier; cf., however, Rzehak below). Consult Rzehak, "Der Unterkiefer von Ochos," in *Verhandlungen der Naturforschenden Vereinigung,* vol. xliv (Brunn, 1906).

The following examples, Nos. 25, 26, and 27, are referable to the modern type, viz., *Homo sapiens.*

25. *Moulin Quignon* (*France*).—A human lower jaw of the modern type. The antiquity claimed for this specimen by M. Boucher de Perthes would assign it to an epoch earlier than the Mousterian and consequently than that of *Homo primigenius.* The claims were most carefully investigated by experts before rejection, and the account of the discussions that took place will retain a classical interest in the history of this subject. Consult Hugh Falconer, *Palæontological Memoirs and Notes,* vol. ii (London, 1868).

26. *Dartford* (*England*).—A human skull from a gravel deposit in Kent (England). The skull was found by Mr. Newton, and it has been described by Dr. A. Keith. The type is that of *Homo sapiens,* and the capacity is enormous, amounting probably to about 1800 centimeters. Dr. Keith has referred the specimen to the Acheulian period. If this reference be correct, the existence of *Homo sapiens* at a time when there is no evidence as to the presence of *Homo primigenius* would be established, but the stratigraphical evidence is open to criticism, so that the specimen cannot be regarded as fully authenticated.

27. *Bury St. Edmunds* (*England*).—The fragment of a human skullcap from a gravel deposit near Bury St. Edmunds in Suffolk (England) has been before the public for about 40 years. Dr. Keith has recently achieved a reconstruction of the skull of which the above fragment formed a part. The reconstruction shows a human skull of entirely modern type. The interest of this specimen depends upon the antiquity assigned to it. Thus, it resembles the instances of Galley Hill, Ipswich, Moulin Quignon, Dartford, and others.

By some authorities the Bury St. Edmunds fragment has been assigned to the Acheulian epoch, to a time, that is, when no good evidence as to the existence of even *Homo primigenius* is forthcoming.

The evidence as to the contemporaneity of the Bury St. Edmunds skeleton with the deposition of the strata in which it lay is of the same nature as in those other instances. In none of these is the evidence conclusive, and no multiplication of the number of such instances will strengthen the case for their great antiquity, unless and until the nature of the evidence is altered in the direction of greater conclusiveness. For the present, therefore, it is better to withhold them all from the category of well-authenticated examples. Consult Arthur Keith, *Journal of Anatomy and Physiology* (London, 1913).

In the preceding notes account has been taken of the earliest representatives of humanity, then of *Homo primigenius,* and also of certain examples of *Homo sapiens,* for which great antiquity is claimed in some quarters.

The remaining skeletons (or fragments) mentioned in the table are all undoubtedly referable to the type of *Homo sapiens.* Without exception they were found in caves, and their antiquity is clearly shown and known. They are of later date than the latest deposit, which has hitherto yielded *Homo primigenius,* save in instances where disturbance of deposits of different ages has led to their admixture. The skeletons now to be considered belong for the most part to that division of the Paleolithic period called Aurignacian. One example comes from the succeeding Magdalenian epoch, but all are of Post-Mousterian antiquity.

Although the men of the Aurignacian epoch are always and undoubtedly of the type of *Homo sapiens,* nevertheless there are certain differences, so that distinctions of a racial kind have been drawn. Consequently the notes on skeletons of Aurignacian antiquity fall into three divisions, each corresponding to one of these racial types, while all are included under the general designation of *Homo sapiens.*

A. RACE OF CRO-MAGNON. This is exemplified by the following instances.

28. *Cro-Magnon* (*France*).—The skeleton known as that of the "old man of Cro-Magnon," discovered nearly 50 years ago by Messrs. Christy and Larlet, has provided a name for one of these racial types.

The most prominent characters are the great stature and strength, as evinced by the length and massiveness of the limb bones, the skull being proportionately large. Judged by the skeleton, the men of the Cro-Magnon race have not since their appearance been surpassed as regards physique, no matter what subsequent epoch be selected for comparison.

29. *Paviland* (*South Wales*).—A skeleton (without the skull) found in the Paviland cave in South Wales is identified in type with the Cro-Magnon race. This specimen has an historical interest of very special kind. When found in or about the year 1823, it was supposed to be referable to the Roman-British period, and it was assigned to the female sex. Nearly 90 years were to elapse before its true antiquity was demonstrated. This was done in 1912 by Professor Sollas, of Oxford, so that the skeleton is now to be regarded as that of a man of Aurignacian antiquity, agreeing in stature with the standard examples of the Cro-Magnon race. Consult *Paviland Cave: An Aurignacian Station in Wales,* Huxley Memorial Lecture for 1913, published by the Royal Anthropological Institute of Great Britain and Ireland (London, 1913).

30. *Barma Grande* (*Mentone*).—Two skeletons of the Cro-Magnon type, from the Mentone cave of that name. They have been described by Professor Verneau, of Paris, to whom is due an account of several other skeletons from Mentone.

31. *Cavillon* (*Mentone*).—A skeleton of the Cro-Magnon type. It was found in the Grotte du Cavillon near Mentone, and it was described by Professor Verneau.

B. RACE OF GRIMALDI.

32. *Grotto des Enfants* (*Mentone*).—Two hu-

man skeletons from the very lowest part of the Aurignacian strata in the Grotte des Enfants differ from those typical of the Cro-Magnon race. They must be very particularly distinguished from the skeleton of the Cro-Magnon type which was actually found in this same cave, but at a higher level. Some indications exist to the effect that the two skeletons thus distinguished should be accorded an antiquity greater than that expressed by the term "Aurignacian"; but, though the claims to Pre-Aurignacian antiquity exist, they cannot be conceded as they stand. However this may be, the race of Grimaldi is a conception based on the study of the two skeletons, and its chief claim to interest is that suggestions of the African negro type were met with. The two skeletons had been interred and were found almost in contact with each other. Both were in a contracted attitude, and each had been placed so as to rest on the right side. While admitting the distinctness of the Grimaldi type, it is not held that the negro affinities are in any way proved. Yet even the suggestion of such resemblances must not be ignored. Future discoveries may well elucidate their real significance.

C. RACE REPRESENTED BY HOMO AURIGNACENSIS HAUSERI.

33. *Combe-Capelle (France)*.—A human skeleton from an interment of Aurignacian antiquity at Combe-Capelle has been designated *Homo aurignacensis hauseri*. The latter term commemorates the name of its discoverer, who (it may be noted) also found the young *Homo mousterensis* in the same region.

Homo aurignacensis hauseri is of a racial type of *Homo sapiens* differing from the Cro-Magnon and Grimaldi racial types alike. In the absence of other examples its real affinities must be matters of surmise only; but the narrow and high brain case, together with the form of the orbital and nasal apertures, confer on the skull an aspect strongly reminiscent of certain skulls from New Britain (New Pommern). The present writer is not alone in remarking these characters and the analogy they suggest. The subject has been worked out independently by Professor Mochi, yet the view here taken is that these resemblances are merely hints and suggestions, as in the analogous instance of the Grimaldi skeletons. Consult Klaatsch, "Der neue Skelettfund Hausers aus dem Aurignacien," in *Prähistorische Zeitschrift*, vol. i (Berlin, 1909), and *Zeitschrift für Ethnologie* (ib., 1911).

Of the paleolithic epochs later than the Aurignacian, a single example has been selected for a descriptive note.

34. *Chancelade (France)*.—The human skeleton of Magdalenian (i.e., Post-Aurignacian) antiquity has undoubted analogies with the Cro-Magnon racial type, but in addition an interest of another kind is presented by the alleged Eskimo affinities of this example. It will be remembered that, upon the evidence of the animal remains found in Magdalenian deposits, that epoch has been credited with climatic conditions such as would assimilate the south of France to the present-day conditions of Greenland. That the man of the period should resemble the existing Eskimo is intelligible enough. Moreover, the imagination of some writers enables them to recognize in the Eskimo of to-day the lineal descendants of the Magdalenian Western Europeans. These are supposed to have emigrated when the climate changed.

Such occurrences are quite possible, and in regard to the latter part of the hypothesis, all that can be said is that direct evidence has yet to be presented. But more particularly in reference to the Eskimo features in the skull from Chancelade, it is clear, even from photographs of that specimen, that the identifications rest on the most fragile of foundations. So far as osteological investigations go, there appear to be no good grounds for separating the Chancelade man from the group already described as the Cro-Magnon race. Consult L. Testut, *Recherches anthropologiques sur le squelette quarternaire de Chancelade* (Lyons, 1889).

It is not to be supposed that the foregoing series of notes is at all exhaustive, but under the circumstances it would be impossible to provide intelligible descriptions of even a majority of the instances on record. Consequently a choice had to be made, and it is believed that the notes given here deal with all the more important and typical examples.

LIVING RACES

Nowadays the scientific investigation of human races avails itself of essentially different methods from those of mere description or artificial classification. Since Darwin (1809–82) our era has witnessed a remarkable gain in profundity of method. In this connection must be mentioned the rediscovery of Mendel's laws and their application to biological processes, not merely in the animal and plant kingdoms, but as connected with the human species as well. As the human races represent organic or biological forms, they must be subjected to the specific methods of investigation followed by ontogeny, anatomy, physiology, and physical anthropology. Although these sciences furnish the essential foundations for a possible natural classification of races from a biological point of view, physical anthropology will in addition touch those fields of inquiry connected with the ergology, or culture (q.v.), of human subdivisions. This felicitous term designates all the psychic manifestations of races, such as language, religion, agriculture, industrial life, mode of habitation, etc. However, we must recognize that only physical anthropology is able to determine the somatic and morphological differences of human races and to establish their mutual relations.

Even the oldest cultural monuments extant, viz., the old Egyptian paintings on graves and temples, represent widely differing types of humanity. The separation of these types must have occurred at a period of time immeasurably earlier, a period when man branched off from a highly developed vertebrate type. This fact is important for the comprehension of biological processes. We meet here a fundamental property of organic life, variability, i.e., the ability immanent in organisms to produce alterations in any of their characteristics. The causes of variation include natural or sexual selection, climate, nutrition, social environment, as well as, in all probability, factors as yet unknown. Granting variability, we must assume that from a highly developed vertebrate—a hypothetical paleoprimate—there developed both the anthropoid apes and a being representing man's ancestor. The latter, in the course of its further development, originated the morphological peculiarities distinguished as human in contradistinction from those of the most nearly allied vertebrates, the anthropoids. We must vigorously oppose the view often met with in lay circles that man developed directly from the anthropoids. The morphological peculiarities referred to consisted in the larger head and the consequent increase in the size of the brain. With higher ideational processes there developed a specialization in the use of the frontal extremities and the upright gait, and articulate speech arose, connecting phonetic symbols with ideas. However, a second element of basic significance must be mentioned—heredity. Alterations are effective in the production of an organic form only in so far as they are inherited. In order that a new species should originate, it was a prerequisite that the effects of selection, of the struggle of existence or environmental factors, should be inherited. Whether man originated in a single spot (monogenetically) or in several distinct places (polygenetically) is a question that has lost significance compared with the study of the conditions of human development. More attention should be devoted to the problem whether the same unknown factors that determined the origin of the new human species also effected the differentiation of morphologically and somatologically distinct races, and to what extent additional influences were responsible for this phenomenon. Science is attempting to solve this puzzle by various experimental researches. The comparative studies of Mollison on serum, of Friedenthal and G. Retzius on sperm cells, of Mollison on the color sense have already furnished results that form a basis for future work. Presumably the changes produced in plants and animals by experimental influences due to changes in light, heat, and food may be applied to the human problem.

If the inheritance of specific traits is a condition of the origin and propagation of a species, the same rule holds for subdivisions of a species, i.e., the varieties. These may be called races. "A race," says Rudolf Martin, "is a constant variety of a species." The external, readily discernible criteria of races are the starting point of even the oldest attempts at racial description. Naturally this also applies to modern investigation, however different may be the novel points of view assumed.

The main criteria to be considered are: (1) the form of the hair; (2) pigmentation of the skin, hair, and iris; (3) the form of the skull, including not merely the ratio of breadth and length (or cephalic index), but absolute measurements of the face and brain case, as well as skull texture and capacity; (4) physical size and the bodily proportions; (5) physiognomic traits, such as the ear, nose, lips, eyelids; (6) the soft parts, such as muscles, nerves, vascular elements; and the phenomena amenable to physiological experimentation.

On the basis of these criteria various systems of classification have arisen which may be distinguished as natural and artificial. Among the latter may be mentioned the classification of A. Retzius (1796–1860) and his followers, who distinguish orthognathous and prognathous longheads (dolichocephali) and orthognathous and prognathous shortheads (brachycephali), thus relying only on the form of the skull. Kollmann makes additional use of the form of the face, dividing mankind into broad-faced and narrow-faced types, each subdivided according to short, long, or intermediate character of the skull; these six categories are again subdivided according to the smooth, curly, or frizzy nature of the hair. In this connection may be mentioned Fr. Müller (1834–98), whose system serves as an example of a mixed morphological and cultural basis of classification. He distinguishes woolly and smooth-haired varieties with minor subdivisions based on linguistic types. The natural systems are based on differences in pigmentation. Thus, Linnæus (1707–78) recognized *Homo europæus, asiaticus, afer* (*africanus*), and *americanus;* Blumenbach (1752–1840) distinguishes the Caucasian, Mongolian, Ethiopian, American, and Malayan varieties; Cuvier (1769–1832), Broca (1824–80), and Topinard (1830–1911) divide mankind into the white, yellow, and black races; while Huxley (1825–95) recognizes Australoid, Negroid, Xanthochroic (blond), and Mongoloid types, to which he adds the Melanochroic group (dark South Europeans) as a hybrid variety.

All the above-mentioned classifications are far too schematic. We are indeed in need of general terms for the large homogeneous groups of humanity. However, a rational system must start from the composition of human groups and seek to determine their relations to pure types, an arduous task far from completion. It is entirely unjustifiable to base classification on a single morphological or somatic trait. It is worse to classify according to cultural factors, such as speech, religion, or social customs, for the core of the problem remains untouched by these ethnological criteria, which have nothing to do with physical characteristics. Any system will meet with better success that shall establish racial groups according to their general morphological features. Thus, Deniker's classification is based on a joint consideration of the form of the hair, skin color, form of the nose, head form, and stature. There is no division into main branches corresponding to those of the authors mentioned above. Deniker establishes six groups according to the criteria named and subdivides these into 29 races, to wit:

A. WOOLLY HAIR, BROAD NOSE
  1. Bushmen
  2. Negrito
  3. Negro
  4. Melanesian

B. CURLY OR WAVY HAIR
  5. Ethiopian
  6. Australian
  7. Dravidian
  8. Assyroid

C. WAVY BROWN OR BLACK HAIR, DARK EYES
  9. Indo-Afghan
  10. Arab or Semite
  11. Berber
  12. Littoral European
  13. Ibero-insular
  14. Western European
  15. Adriatic

D. FAIR, WAVY OR STRAIGHT HAIR, LIGHT EYES
  16. Northern European
  17. Eastern European

E. STRAIGHT OR WAVY HAIR, DARK, BLACK EYES
  18. Ainu
  19. Polynesian

  20. Indonesian
  21. South American
F. STRAIGHT HAIR
  22. North American
  23. Central American
  24. Patagonian
  25. Eskimo
  26. Lapp
  27. Ugrian
  28. Turkish or Turco-Tatar
  29. Mongol

Each of these varieties is characterized according to bodily traits, although *named* in part after merely national groups; they are therefore genuine racial subdivisions.

There have been some attempts to establish a racial classification by creating a nomenclature according to zoölogical principles. Of these, only those of Wilser and Sergi need be mentioned. Wilser distinguishes his largest groups as zoölogically distinct species, which are subdivided into varieties.

A. *Proanthropus erectus* (*Pithecanthropus dubois*).

B. *Homo primigenius.*

C. *Homo europæus* (*Homo europæus* var. *fossilis* [Cro-Magnon], *Homo europæus* var. *mediterranea* [var. *fossilis* (Brunn, Brux, etc.)]).

D. *Homo niger* s. *afer* (var. *fossilis* [Grimaldi], var. *australis, etc.*).

E. *Homo brachycephalus* s. *asiaticus* (var. *fossilis* [Grenelle, Furfooz, etc.], var. *alpina*, var. *americana, etc.*).

Sergi's system is probably the one best adapted to modern demands, though his derivation of the European race from Central Africa is unacceptable. He divides all humanity, both living and extinct, into five genera, subdivided into species and varieties. The following gives a compact presentation of his views:

A. PALÆANTHROPUS (extinct)
  1. *Palæanthr. europæus* (Neanderthaler, etc.)
  2. " *krapinensis*
  3. " *heidelbergensis*
B. ARCHÆANTHROPUS (extinct)
  1. *Archæanthr. pampæus* (La Tigra, etc.)
C. NOTANTHROPUS (notos = south)
  1. *Notanthr. eurafricanus*
    a. *Not. eurafr. nordicus* (Sweden, Norway)
    b. " " *africus* (Abyssinian, Galla, etc.)
    c. " " *dravidicus*
    d. " " *polynesianus*
    e. " " *tod-ainu*
    f. " " *mediterraneus*
    g. " " *medit. europæus* (southern Italy)
    h. " " " *libycus*
    i. " " " *arabicus*
    j. " " " *egyptianus*
    k. " " " *indoiranus*
  2. *Notanthropus afer*
  3. " *australis* (Hottentots)
D. HEOANTHROPUS (eos = east)
  1. *Heoanthr. eurasicus*
    a. *Heo. euras. europæus* (Great Russians)
    b. " " *asiaticus* (until now known as *alpinus*)
  2. *Heoanthr. arcticus*
  3. " *orientalis*
E. HESPERANTHROPUS (hesperos = west)
  1. *Hesperanthr. columbi* (American Indians, Eskimo)
  2. " *patagonicus*

In short, there is no dearth of racial classifications. However, the grouping of the human material in these divisions forms a very intricate problem, for the groups found by the student represent a highly mixed product of the species *Homo.* We must go back very far indeed to meet with a group of relatively unmixed representatives of a single race; indeed, many deny the existence of pure races.

Racial diagnosis in cases of mixture is greatly aided by the Mendelian laws of inheritance, which after a period of complete neglect have recently been rediscovered and proved their usefulness in an astonishing manner. Mendel holds that parental traits are inherited in succeeding generations in a definite proportion of cases, so that hybridization results in a certain constancy of the traits. From this point of view the racial problem is simplified in an objective way. Several scientists, e.g., E. Fischer in his excellent studies of the Hottentot bastards, have already applied Mendelian conclusions to racial investigation. Fischer corroborates the rule that mixture of two distinct races never effects the origin of a new race. The traits of the two races are inherited independently, i.e., the traits of the one persist and combine with those of the other. Thus there may result an increasing host of traits in combination. In order to investigate these, new statistical methods have been developed (especially by Karl Pearson), leading to the science of biometry. However, there never develops a new race. On the contrary, each race reverts to its original type, a process of "demiscegenation" (*Entmischung*), to use Von Luschan's term.

The means employed in racial study include (*a*) observations of dead material, including both skeletal remains and soft parts; (*b*) observations of living individuals (somatology, bodily proportions, physiology); (*c*) socio-anthropological investigations on the influence of locality, diet, labor, and social condition. To these must be added the abstract treatment of heredity by statistical study and the methods of experimental biology as applied to men. Thus, Walcher has attempted to produce arbitrarily short-headedness or long-headedness by consistent treatment of infant skulls. The influence of environmental conditions seems to be indicated by Boas's studies on the American-born children of East European Jewish, Neapolitan, and Sicilian immigrants. He discovered that the brachycephalous Jewish children were not so short-headed, and the dolichocephalous Italian children not so long-headed, as their parents, both approaching an intermediate mesocephalous type.

A brief summary of the status of racial investigation in the grand divisions of the globe will be given presently. Stress must be laid on the fact that so far we have made only a fair start towards the solution of the problems, whether centring (1) in the determination of the number and distribution of racial types or (2) in their relations to the prehistoric races and one another, from both a purely biological and an ethnological point of view. Detailed considerations as to the persistence and disappearance of races cannot be made in this general article.

Europe. Deniker has industriously compiled data on the distribution of racial traits. He recognizes six European races, with specific zones of distribution: (1) *Northern race*, tall, blond, light-eyed, long-headed, narrow-faced, with narrow, straight nose; (2) *Eastern race*, of shorter stature, with broader face and nose; (3) *Western Alpine race*, short, brown, very short-headed, with round face and broad nose; (4) *Ibero-insular* or *Mediterranean race*, dark-brown, short, dark-skinned, with narrow, straight nose; (5) *Coastal* or *Atlanto-Mediterranean race*, of tall or medium stature, mesocephalic, dark; (6) *Adriatic* or *Dinaric race*, very tall, very short-headed, dark, with straight or convex nose. Of these groups, Nos. 1, 3, 4, and 6 are generally recognized. Scientists assume that the home of the blond race lies in the north. The Asiatic origin of the Alpine race is regarded as fairly certain, though the occurrence of short skulls in diluvial times leads some, e.g., Giuffrida-Ruggeri, to champion an independent development of shortheads in western Europe. Opinion is divided as to the Mediterranean race, which some scholars view as an independent Southern group, while others regard it as a branch of the North African race, mixed with elements from Asia Minor. Still others hold that it is a branch of the Northern race that has become darker and shorter and unite it with the Dravidians of India (E. Fischer). The Dinaric race points to a connection with Asia Minor, i.e., with Von Luschan's Armenoids. On this hypothesis the distribution of the Armenoid type would extend to central Europe. In quite recent times efforts have been made to identify certain head forms with various old cultural epochs (Schliz).

Asia Minor. Von Luschan assumes Armenoid aborigines whose presence dates back at least to the second pre-Christian millennium. The Hittites are assuredly an integral portion of the autochthonous population. They are characterized by an extremely flat occiput and a crudely hooked nose. In the ninth century B.C., Semitic tribes immigrated and blended with the natives. From the valley of the Danube came a third element, the Amorites, whose tall stature and light hair point to a relationship with the Northern race. To their influence Von Luschan ascribes Semitic blondness. The racial composition of the Semites has not been satisfactorily ascertained. There are short-headed elements, represented by the Askenassi, and long-headed elements, such as the Sephardim. These differences, coupled with those of the color and form of the hair, point to a complex racial composition.

Africa. In northern Africa anthropology must deal with the Egyptians, Berbers, and Guanchos. The Egyptian question is of special interest because its development may be traced back to predynastic times by means of the skeletal material extant, the oldest dolichocephalous skulls being gradually supplanted by mesocephalous heads. A blend with foreign types is indicated by Negroid and short-headed (Asiatic) elements. In northwestern Africa the occurrence of the blond blue-eyed type points towards a mixture of Berber and North European types. The Guanchos of the Canary Islands display points of contact with the Berbers and the Egyptians, as well as with the Iberians and the prehistoric Cro-Magnon type.

In the remainder of Africa the racial relations are likewise highly complicated and far removed from solution. Probably the Pygmies were originally distributed over the entire continent. Their relations towards the Bushmen are still quite obscure. All we know is that steatopygous Pygmies (i.e., possessing the abnormal development of the gluteal region found among the Hottentot) were known to the ancient Egyptians, and that plastic representations extending to Crete, Austria, and France date back to the Stone age. The same applies to the Bushman-like cave paintings of the Stone age, which occur in Tunisia, France, and Spain, resembling those in South Africa. The position of the Pygmies in regard to the primitive Negro population of Africa remains an unsolved problem. The two large linguistic groups, Bantu and Sudan Negroes, embrace so many distinct anthropological types that no definite statement can be given regarding their interrelations. The purest form of Negro type seems to occur on the Guinea coast, while the Bantu seem to have been changed appreciably by North African and Northeast African races.

Malay Archipelago and South Seas. The racial conditions of the Malay Archipelago are fairly clear, owing to the anthropological labors of the Sarasin cousins, Rudolf Martin, Hagen, and Moszkowski. The lowest stratum is represented by the Vedda of Ceylon, Toala of Celebes, Senoi of central Malacca, Kubu and Sakei of Sumatra, and the Kha, Mai, and Penong of the Indian mainland. This genuinely autochthonous race probably occupied the territory prior to the geological separation of the Malayan islands. A second layer represented only by survivals is constituted by the Semang, Andaman Islanders, and Philippine Negrito. It probably extends to the Papuas, and there may be some connection with the African Pygmies. Finally, there are the Malays of the earlier type (Battak, Dayak, Igorot) and of a later period (Coast Malays, Javans). The racial relations of Oceania are obscure. Those of the Australians have become better known through Klaatsch's excellent papers describing their "pre-Neanderthaloid" traits.

Asia (exclusive of Asia Minor). The physical anthropology of this continent is relatively little known, though the work of Japanese scholars, such as Koganei and Adachi, is of great value. The Ainu seem to represent a primitive Japanese stratum, with relations to the Indo-Germanic type and points of contact with the Australians. The Japanese may be divided into a cruder and a more refined type, the former suggesting southern China, while the latter rather points to the Northern Chinese. China is practically a terra incognita, and the connection of Mongolian and European races is likewise obscure. The same must be said of the racial interrelations of India and the connection of the Indians with Europeans, though significant resemblances occur.

America. So far there is no clear evidence of man's existence in America before or during the Glacial period. The specific form of the American variety developed in that continent, but it remains unsettled whether anthropological relations connect it with the races of other grand divisions. For the Eskimo, Asiatic connections seem definitely proved. Their Mongolian traits suggest an origin beyond Bering Strait. For the Indians such a hypothesis is far from being demonstrated. Ehrenreich affiliates them, in spite of the Mongoloid features they display, with the Caucasians. There certainly is a very great multiplicity of types distributed over North and South America. Hrdlička enumerates both long-headed and short-headed groups, and the study of South American aborigines points to the existence of several distinct anthropological layers. American Indian traits include the uniformly straight hair, which has a nearly round cross section; a large and projecting nose; a greater than Caucasian degree of prognathy; prominent zygomatic arches; small hands and feet; and a fair muscular development. Culturally the American natives have not been purely passive, but have spread their own culture, as was shown in the course of the Jesup expedition.

The question of the development of a specifically modern (white) American type due to adaptation to modern American environmental influences will have to be settled in the future. The same applies to moot problems discussed under the title eugenics (q.v.), by which is meant the deliberate selection of mates for the procreation of physically and morally perfect individuals.

In place of statistical census data on the races we are unfortunately obliged to rely on estimates of conjectural value. The number of Mongolians is set at from 500 to 600 million; that of Europeans (including the four races specified above) at from 600 to 700 million; that of African Negroids at from 100 to 120 million.

Bibliography. For a classification of races, consult: J. Deniker, *The Races of Man* (London, 1900); A. H. Keane, *Ethnology* (2d ed., Cambridge, 1896; reprinted, 1901); A. C. Haddon, *The Races of Man* (London, 1912); Giuffrida-Ruggeri, *Homo sapiens* (Vienna, 1913); Rudolf Martin, *Lehrbuch der Anthropologie* (Jena, 1914). The last-mentioned book is a standard up-to-date work with full bibliographies for every phase of physical anthropology. T. H. Huxley's essay "On the Geographical Distribution of the Chief Modifications of Mankind," in *Journal of the Ethnological Society of London*, N. S., vol. ii (London, 1870), is of historical interest. A critical discussion of classification in general is given in Paul Ehrenreich, *Anthropologische Studien über die Urbewohner Brasiliens* (Brunswick, 1897). Among other works of general bearing may be mentioned: W. L. H. Duckworth, *Morphology and Anthropology* (Cambridge, 1904); A. C. Haddon, *The Wanderings of People* (ib., 1911); Ranke, *Der Mensch* (2d ed., 2 vols., Leipzig, 1911–12).

MANABOZHO, măn′ȧ-bō′zhō, NENEBOJO, or MICHABO. The culture hero among some of the Algonquian tribes, e.g., the Menomini; other tribes of this stock venerate the same figure under other names, such as Wisaketcak (Cree). He is represented as the principal agent in the work of creation, the teacher of the various Indian arts of hunting, fishing, and the like, the destroyer of monsters and neutralizer of evil influences, and withal as a great trickster. He is rather a mediator between the supernatural powers and the Indians than a supreme deity himself. In other regions of North America a corresponding figure, presenting the same dual character of hero and clown, appears in the guise of a coyote, raven, etc. For the Algonquian conception consult: Schoolcraft, *The Myth of Hiawatha* (Philadelphia, 1856); W. J. Hoffman, "The Menomini Indians," in *Bureau of American Ethnology, Annual Report, 1892–93* (Washington, 1896); Russell, *Explorations in the Far North* (ib., 1898); Jones, *Fox Texts* (Leyden, 1907); Alanson Skinner, *Social Life and Ceremonial Bundles of the Menomini Indians* (New York, 1913); Paul Radin, *Some Myths and Tales of the Ojibwa of Southeastern Ontario* (Ottawa, 1914).

MANACOR, mä′nȧ-kôr′. A town on the island of Majorca, Spain. It is situated on a small eminence surrounded by a fertile plain, 8 miles from the east coast of the island (Map: Spain, G 3). The town contains a number of ancient buildings, among which is a palace of the old kings of Majorca. It has manufactures of brandy, flour, pottery, and leather; is connected with Palma by rail, but has no great commercial importance. Not far away are interesting caves: that of Drach, containing several underground lakes, and those of Artá, four miles away, forming one of the most spacious and beautiful groups of stalactite caves in western Europe. Pop., 1900, 12,548; 1910, 12,436.

MANAGEMENT, HOME AND INSTITUTION. Considered as a branch of home economics, this treats of the administration of the affairs of a private family or of a larger group of people living together and has to do less with details of housework than with matters of general policy in housekeeping and home making; and though the outlining of plans and the oversight of details fall to the same person in the great majority of homes and often in institution households, the responsibilities connected with them can be separated in thought, and are, indeed, discussed under different heads in technical treatises on home economics and for educational purposes.

The successful management of a home, small or large, presupposes some understanding of available resources in the way of labor, power, and money; certain standards for the work to be performed and ideals for the ends to be reached as the result of family life or coöperative living, and some ability to direct available means towards desired accomplishments. Available labor includes that of members of the household, of hired helpers, permanent or temporary, and, in a broader sense, of persons working for the home in bakeries, laundries, or other places where commodities needed in the household are made or needed services are performed. One duty of the home or institution manager is to decide whether a given piece of work shall be done in the home or outside of it; by members of the household or hired helpers; by adults entirely or partly by children for purposes of training in household arts; directly or by machinery; by hand or other forms of power. Such choices, almost unknown under primitive conditions, present themselves with increasing frequency as factory methods of producing household commodities develop, as specialization extends to new fields and results in separate establishments for cleaning, catering, the care of the sick, and other services previously performed only in the household, and as improvements in communication and transportation (parcel post, rural delivery, telephone) bring isolated homes within reach of markets for commodities and services.

Wider opportunities for choice as to methods are creating a demand for more accurate means of judging and comparing results and for a clearer understanding of the relation of household processes and products to comfort, health, and human needs in general. This demand is being met by the publication of works on the chemistry of food and textiles, household sanitation, hygiene and decoration, and by courses of instruction in all branches of home economics. More important still, standards are being formulated. Score cards have been devised for judging many products—e.g., bread and canned goods. In large institutions and schools studies are being made of the time required for performing various household tasks and of the comparative cost of homemade and commercial articles, and all along the line the tendency is towards standardization of methods and results.

The apportionment of the income of family or institution among the various items of expenditure—rent, food, clothing, recreation, and others—is another function of household management. In estimating income it is necessary to take into account not only the money earned by members of the family or the amount appropriated for the support of the institution, but also the value of commodities produced and consumed in the household—e.g., vegetables or articles of clothing and house furnishing—and the estimation of this part of the income waits in many cases upon a more general agreement as to the value of the home maker's time. In the case of private families particularly agreement is retarded by the fact that as household industries disappear there is a tendency to emphasize the importance of the home as a place where the affections centre, where children are trained and character is developed. There is a tendency, too, to emphasize the home-making features in public institutions, particularly those that care for dependent children or old people. This in many cases makes the services of the manager difficult to measure in terms of money. There is, however, a movement towards the adoption of business methods so far as they are applicable—a fact to which the growing custom of making budgets, i.e., of determining beforehand how the income shall be apportioned and of keeping and interpreting household accounts, testifies.

So great are the possible economies in energy and money where large numbers of people are concerned that institution management has already been placed upon a professional basis, and while the management of a private home has to do with smaller amounts of money and with values more difficult to estimate, it is not far behind in this respect.

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MANAGEMENT, Legislative. In industry, a policy and practice of management developed from the "committee system" and still equally well recognized under that name. The aim is to apply the principle of staff guidance without impairing line organization and at the same time to enlarge the viewpoint and enlist the coöperation of directing line officials by methods of suggestion akin to those characterizing the Hine system of unit organization. See Efficiency.

Under the committee system as advocated by C. U. Carpenter in 1908 a general factory committee was formed to consider the most important questions arising in the works and act as advisers to the management. The *personnel* of this committee was so selected as to bring together the ablest and most experienced heads of departments, upon whose harmonious working the general success of the plant depends. These would probably be the chief designer of product, the chief designer of tools, the head of the cost department, and one or two general foremen, under the chairmanship of the superintendent. Thus into one group would be brought men representing knowledge of the kind of product that could be sold, of the kind of equipment necessary for its manufacture, of the cost of manufacturing it, and of the practical execution of the manufacturing operations. Past difficulties, current progress, future possibilities, departmental schedules for the completion of work in hand or to be undertaken, could be discussed and determined by the men certainly responsible for the several phases of the work, and an immediate written record made for reference and comparison at the next stated meeting. With frequent meetings and a consciousness that reports would be required and compared with promises, it was believed that a sense of responsibility would be heightened; while with the sense of a joint share in the success of a department programme, it was believed that a feeling of larger relations and a wider vision of duties would be fostered.

A similar system of committee organization was carried through the lower ranks by subsidiary committees made up of general foremen and minor officials, the idea everywhere being frequent conferences, open discussions, and stenographic or blackboard records for exhibition at the next meeting.

As further developed by C. E. Knoeppel, legislative management shows the influence of some of the doctrines of scientific management (q.v.). Instead of a single comprehensive and general factory committee, certain "functionalized" activities of the plant are recognized and each of these is put under its own committee, the six functional committees thus constituted being coördinated and controlled in their work by an executive committee. The functional activities recognized and provided for are engineering and drafting, planning, conditions, operations, materials, and relations and incentives. The committees separately charged with each of these functions meet regularly or at the call of the executive committee, consider carefully all matters referred to them, and submit their conclusions with the reasons supporting them to the executive committee, by whom they are either accepted and made binding upon line officials or returned to the committee for further deliberation or to staff advisers for investigation.

The several committees, as under the Carpenter system, are made up principally from line officials, thus made also staff advisers, although in Knoeppel's legislative management a representative of the efficiency staff appears in every one of the functional committees. A summary of his suggested choice of *personnel* is appended, the explanatory words in parentheses indicating the interest represented by each member of each committee.

ARRANGEMENT OF COMMITTEES UNDER LEGISLATIVE (FACTORY) MANAGEMENT

Executive Committee: General manager (administrative); chief designer (product); office manager (records and data); treasurer or accountant (finance); superintendent and assistant superintendent (shop); and efficiency engineer (betterment work).

Engineering and Drafting Committee: Sales manager (customers); chief designer (product); superintendent (shop); and efficiency engineer (betterment work).

Planning Committee: Superintendent (shop); purchasing agent (materials); foreman of department affected (individual department); and efficiency engineer (betterment work).

Conditions Committee: Superintendent (shop); master mechanic (mechanical work); labor boss (labor work); foreman of department affected (individual department); and efficiency engineer (betterment work).

Operations Committee: Superintendent (shop); chief inspector (quality of product); functional supervisor (speeds and feeds, or jigs and fixtures, or foundry work, or belting, etc.); foreman of department affected (individual department); and efficiency engineer (betterment work).

Materials Committee: Purchasing agent (supply of materials); stores keeper (custody of materials); foreman of department affected (individual department); and efficiency engineer (betterment work).

Relations and Incentives Committee: Superintendent (shop); foreman of department affected (individual department); representative of workmen (labor); and efficiency engineer (betterment work).

Consult C. U. Carpenter, *Profit-Making Management in Shop and Factory* (New York, 1908), and C. E. Knoeppel, *The Practical Introduction of Efficiency Principles* (ib., 1914).

MANAGEMENT, SCIENTIFIC. See SCIENTIFIC MANAGEMENT.

MANAGUA, mȧ-nä'gwȧ. The capital of Nicaragua, in a healthful and fertile district on the south shore of Lake Managua (Map: Central America, D 4). The town has little or no importance save as capital. It has a good water supply, and trades in the coffee grown in the surrounding district. It is the seat of a United States consul. Pop., 35,000. Managua was made the capital of the country in 1855 to put an end to the rival claims of León and Granada. In 1876 it was destroyed by an inundation, but was soon rebuilt.

MANAGUA (mȧ-nä'gwȧ) **LAKE** (formerly called LAKE LEÓN). A lake in Nicaragua, Central America, situated 8 miles northwest of Lake Nicaragua, with which it communicates intermittently through the Tipitapa River (Map: Central America, D 4). Lake Managua is 40 miles long and 6 to 15 miles wide and its waters lie 30 feet above the level of Lake Nicaragua. It is believed that the latter was formerly at a higher level than now and that the two once formed a single lake. The shores of Lake Managua are remarkable for their picturesque scenery, which is dominated on the northwest shore by the volcano of Monotombo. Several steamers ply on the lake, and Managua, the capital of the republic, is situated on its southern shore.

MANAHIKI (mä'nȧ-hē'kê) **ISLAND.** An atoll, one of many small coral islands scattered over central Polynesia between lat. 4° and 12° S. and long. 150° and 166° W., northeast of the Samoan Islands. Manahiki is situated in about 10° S. lat. and 160° W. long. Its area is about 30 square miles, with the greater part of its surface covered by a broad lagoon. Pop., 1911, 444. It now belongs to Great Britain and, together with the Cook Islands, is under the administration of New Zealand.

MAN'AKIN (OF. *manequin*, Fr. *mannequin*, from MDutch *manneken*, dim. of *man*, man). The name manakin (or manikin) is applied to a large group of small tropical American birds difficult to define. In its narrowest sense the term is confined to the few species of the genus *Manacus*, which are birds with comparatively dull-colored plumage, but having the feathers of the chin elongated and puffed like a beard. In a broader way the term applies to the whole family Pipridæ, while by some writers it is extended to some of the Cotingidæ, a closely allied family. (A representative form of *Pipra* is illustrated on the Plate of COTINGAS, ETC.) In such senses, manakins are small, usually brightly colored birds with short, square tails and a short, vaulted, broad bill, the upper mandible hooked at the tip and with a notch behind the point. In some species the wings and tail are modified so as to become very ornamental, and these changes are sometimes extraordinary. The sexes are very different in color, the females generally being greenish, while the males are usually glossy black, ornamented with brilliant scarlet, yellow, or blue. In the genus *Heteropelma*, however, both sexes are dull-colored, while in *Machæropterus* the general color is bright green with a fiery red crown and the lower surface streaked, brown and white. The latter genus is further remarkable for the peculiar thickening of the tips of the shafts of some of the inner wing feathers, so that they appear as if ending in a pointed claw. In habits the manakins resemble tits and chickadees, hopping about in the lower undergrowth and feeding chiefly on insects. They are not song birds, however, but are more nearly related to the North American flycatchers. They are often seen on the ground, and some species nest there. A Brazilian species (*Chiroxiphia caudata*) is known as dansador on account of a peculiar habit when several are together of holding small dancing parties; one individual whistles steadily while the others dance around him, until the musician tires, when he exchanges places with one of the dancers.

MAN AND SUPERMAN. A drama by George Bernard Shaw (1903), produced in London in 1905. The leading idea is that woman is the dominating force in developing a higher form of being, the superman.

MANAOAG, mȧ-nä'wȧg. A town and junction point of Luzon, Philippines, in the Province of Pangasinán, 18 miles east of Lingayén (Map: Luzon, D 2). It has good road connection with stations on the Manila-Dagupán Railroad. Pop., 1903, 16,793.

MANAOS, mȧ-nä'ôsh. Capital of the State of Amazonas, Brazil, situated on the east bank of the Rio Negro, 10 miles from its junction with the Amazon and 1000 miles from the Atlantic (Map: Brazil, F 4). It is a large and well-built city, lighted by electricity, and has fine parks and public buildings, a lyceum, a school of chemistry, a museum, and a public library. The city has a good harbor to which ocean steamers ascend directly from Europe and the United States, and is an important commercial and shipping centre with a flourishing trade in the products of the Amazon forests, especially rubber, which it exports in large quantities. The city is connected by cable with Pará, and is the seat of a United States consular agent.

Pop. (est.), 1901, 30,000; 1912, 50,000. Manaos originated in a Portuguese fort built here in 1804 as an outpost for the slave trade. It was first called Barra do Rio Negro, and received its present name in 1836, from a neighboring tribe of Indians. It became the capital of the state in 1852.

MANAR, må-när′, Gulf of. The southern and wider part of the channel separating Ceylon from the south extremity of India (Map: India, D 8). It is nearly 150 miles wide at its broadest part, and narrows northward into Palk Strait, from which it is divided by a chain of islands and a low reef called Adam's Bridge.

MANASAROWAR, må-nä′sä-rô-wär′. Two lakes situated north of the Himalaya Mountains, one of which is the source of the Indus. According to the account in the Hindu Scriptures the eastern lake was formed when the ocean first fell down from the heavens, and it is one of the most sacred places of pilgrimage, both for the Hindus and for the Tatars.

MANAS′SAS. A town and the county seat of Prince William Co., Va., 33 miles by rail west of Washington, D. C., on the Southern and the Chesapeake and Ohio railroads (Map: Virginia, G 3). It is the seat of Eastern College and of the Manassas Industrial School, while in the vicinity lies the battlefield of Bull Run (q.v.). The town owns its water works, electric-light plant, and sewer system. Pop., 1910, 1217.

MANAS′SAS, First and Second Battles of. See Bull Run, First and Second Battles of.

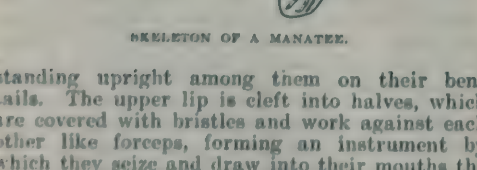
MANAS′SEH (Heb. *Mĕnashsheh,* of uncertain etymology). According to Gen. xli. 51, the eldest son of Joseph and eponymous ancestor of the tribe of Manasseh. Manasseh and Ephraim are regarded by modern scholars as representing two offshoots of a Joseph tribe, the parent branch of which (see Joseph) apparently disappeared in Goshen (q.v.), the territory adjoining Egypt on the northeast and counted as belonging to it. Of the two, Manasseh was the first to cut loose, and was therefore represented in tradition as the older; but the far more prominent part played in the history of the northern kingdom by Ephraim is reflected in the forty-eighth chapter of Genesis, where Jacob, in blessing the two, intentionally mentions Ephraim first, although the younger. Both Manasseh and Ephraim are represented as born in Egypt and sons of Joseph's Egyptian wife. If the tradition rests upon a genuine reminiscence, it may be taken as an indication that the extension of the Joseph tribe into several branches took place in Goshen. Manasseh and Ephraim appear as the most prominent of the tribes that formed the Kingdom of Israel. The territory occupied by Manasseh on the west of the Jordan lay to the north of Ephraim and reached westward to the sea, including the plain of Sharon (Josh. xvii), but the tribe continued to grow and a branch settled to the east of Jordan, occupying part of Gilead, the rich pasture lands of Bashan and the country extending northward from a point above the river Jabbok to Mount Hermon (Josh. xiii. 29–31). The heroes Gideon and Jephthah (Judg. vi. 15, xi. 1) belonged to Manasseh, but, after the formation of the kingdom, Ephraim entirely eclipses Manasseh, of which we hear again only at the time of the invasion of Tiglath-pileser IV (734 b.c.), who carried off the eastern division of the tribe to Assyria (1 Chron. v. 26). The tribe also suffered severely during the various wars with Damascus (2 Kings x. 32–33; cf. Amos i. 3).

MANASSEH. King of Judah, son of Hezekiah and father of Amon. He began to reign c.686 b.c., at the age of 12. His reign is said to have extended over 55 years (2 Kings xxi. 1; 2 Chron. xxxiii. 1), but this figure may be somewhat too high, as his death appears to have taken place no later than 639 b.c. Of the events during his long reign we know little. The narrator in Kings, being so largely interested in the religious side of history, contents himself merely with references to religious conditions in the days of Manasseh. The religious reforms introduced by Hezekiah, tending towards a purer Yahwe worship freed from the Canaanitish practices, naturally aroused opposition, and during Hezekiah's lifetime symptoms of a reaction already began to manifest themselves. The death of Hezekiah marked the height of the reaction, and Manasseh favored the old system and went even to greater lengths than his predecessors in blending the Yahwe cult with foreign elements. Besides readoption of the old Canaanitish practices, Babylonian and Assyrian customs were introduced (2 Kings, xxi. 5–7), and for this the King naturally incurred the hatred of the later historians, who purposely ignored other events of his reign. It appears on the whole to have been peaceable and prosperous, but Manasseh was obliged to pay tribute to Assyria. The story told in Chronicles (2 Chron. xxxiii) of Manasseh's capture by the Assyrians, and of his humbling himself before God and his acts of repentance, is thought to be fictitious. The Book of Kings does not say a word about it, and it resembles a Midrashic tale to illustrate the punishment merited by a king who, to the author of Chronicles, appeared the embodiment of wickedness. The later Jewish Haggada added to such stories of Manasseh's wickedness and subsequent conversion. Consult Rudolf Kittel, *Geschichte des Volkes Israel,* vol. ii (2d ed., Gotha, 1909), and Julius Wellhausen, *Israelitische und jüdische Geschichte* (7th ed., Berlin, 1914).

MANASSEH BEN ISRAEL (1604–57). A Hebrew scholar and cabalist. He was born at Lisbon and educated at Amsterdam, where his father had removed to escape persecution. At the age of 18 he took the place of his former instructor, Rabbi Isaac Uzziel, in the Amsterdam synagogue. In 1626 he set up a Hebrew printing press at Amsterdam and in 1632 published the first volume of his *Conciliador,* a learned harmony of the Pentateuch. Its author was recognized as a great Hebrew scholar, and among his correspondents were Vossius, Grotius, and Huet. In 1656 Manasseh went to England to obtain permission from Parliament for the reëstablishment of the Jews in England, banished from that country since the time of Edward I (1290). Parliament refused to pass the measure, but Cromwell favored it and unofficially permitted a large number of Jews to settle in London. Manasseh died at Middelburg on his way home. His wide learning, the services he rendered his people, the renown he enjoyed among men not of his race, his piety and amiability, have made him a venerated figure in Jewish history. Besides the *Consiliador,* he published editions of the Talmud and Bible in Hebrew; also *Esperanza de Israel* (1650); *Pedro Glorioso* (1655); *Vindiciæ Judæorum,* which appeared at London in 1656 during his stay in England.

MANAS′SES, Prayer of. An apocryphal fragment, not forming a part of the Hebrew canon nor of the deuterocanonical books, but found among the canticles appended to the psalter in Codex Alexandrinus and some other majuscules and cursives, as well as in the *Didascalia*, incorporated into the Apostolic Constitutions, in connection with a quotation of 2 Chron. xxxiii. 12 f. There are Latin, Syriac, Armenian, Slavonic, and Ethiopic versions. It is a psalm expressing the infinite compassion of God and the efficacy of true repentance, as shown in the case of the greatest sinner. Most scholars think that it was written originally in Greek, and the attempts to prove a Semitic original have not yet been convincing. It is apparently later than the Greek translation of Chronicles and earlier than the *Didascalia* (c. 200 A.D.). Consult Ryssel, in E. F. Kautzsch, *Apokryphen und Pseudepigraphen* (Halle, 1899), and H. E. Ryle, in R. H. Charles, *Apocrypha and Pseudepigrapha of the Old Testament* (Oxford, 1913).

MAN′ATEE′ (Sp. *manatí*, from Haitian *manati*, big beaver). An American sea cow of the genus *Manatus*, now nearly extinct on the coast of the United States, but still to be found in the West Indies, eastern Central America, and tropical South America. Manatees are large, seal-like animals, sometimes 10 feet long and weighing more than a ton, with rounded, fleshy tail fins, no hind legs, and the fore legs modified into swimming paws, the bones within which are of the normal type, and which have small, flat nails, except in the Orinoco species. The skin is very thick, dark gray, finely wrinkled, and sparsely provided with stout hairs, most numerous about the head and muzzle and on the palmar surface of the flippers. These animals are entirely aquatic and spend their lives in estuaries, lagoons, and rivers, rarely going out into salt water. They ascend the Amazon and Orinoco almost to their sources, and are incessantly hunted by the natives for their veal-like flesh and the oil which may be obtained from the layer of blubber beneath the skin. They are good but by no means active swimmers, are sluggish in their movements, and spend most of their time in weedy places, where they browse on the aquatic plants, often by standing upright among them on their bent tails. The upper lip is cleft into halves, which are covered with bristles and work against each other like forceps, forming an instrument by which they seize and draw into their mouths the leaves and grasses that form their fare. Connected with this food and manner of feeding is a remarkable dental feature, viz., the large number of molar teeth. These seem indefinitely to increase during the animal's life, and it is suggested that they are worn away by the character of the food—chiefly algæ mixed with much sand. Only one young one is produced annually, but this is nursed and guarded by the mother with extreme care. The young apparently are entirely defenseless, but have few enemies to menace them after they get their growth. Manatees have frequently been kept alive in aquariums for a few months and have proved gentle and docile. Once they were plentiful along both coasts of Florida, but their helplessness led to their destruction, until at the close of the nineteenth century none were left but a small, protected herd in the Miami River. Whether the Florida form, called *Manatus* (or *Hydrodamalis*) *latirostris*, is really distinct from the widely distributed *Manatus americanus* is undecided. The animal of the Orinoco is certainly a separate species (*Manatus inunguis*), distinguished by lack of finger nails. See Sea Cow; and cf. Dugong. Consult C. H. Townsend, "Notes on the Manatee," in *New York Zoölogical Society, Eighth Annual Report* (New York, 1904).



SKELETON OF A MANATEE.

MANATT, J(ames) Irving (1845–1915). An American Greek scholar. Born at Millersburg, Ohio, he served as a private in the forty-sixth Iowa Infantry in 1864; graduated from Iowa (now Grinnell) College in 1869 and from Yale University (Ph.D.) in 1873; and studied at the University of Leipzig in 1876–77. He served as professor of Greek at Denison University (1874–76) and at Marietta College (1877–84) and as chancellor of the University of Nebraska (1884–89). He was United States Consul at Athens in 1889–93, and from 1892 to his death was professor of Greek literature and history at Brown University. He edited Xenophon's *Hellenica*, with commentary (1888), and is author of *The Mycenæan Age* (1897), with Dr. Tsountas, and *Ægean Days* (1913).

MANAUNG. See Cheduba.

MAN′BY, George William (1765–1854). An English inventor of life-saving apparatus, born in Suffolk. He served seven years in the militia and in 1803 was appointed barrack master at Yarmouth. In 1807 he began working on his life-saving apparatus, by which in 1808 he saved the crew of the stranded brig *Elizabeth*. He twice received grants of money from Parliament, to which were added honorary distinctions from many foreign governments. It was estimated that by the time of his death nearly 1000 persons had been rescued from stranded ships by means of his apparatus. His publications include *An Essay on the Preservation of Shipwrecked Persons, with a Descriptive Account of the Apparatus* (1812). Consult the sketch by Aleck Abrahams in *Notes and Queries*, series 10, vol. i (London, 1904).

MANCAN′DO (It., failing). A term in music denoting a gradual decrease in loudness.

MANCE, mäns, Jeanne (1606–73). A French philanthropist, born at Nogent-le-Roi. Her religious feeling was intense and she early vowed perpetual chastity, though she felt no inclination to become a nun. Influenced by the story of Madame de la Peltrie, she blindly determined to go to Canada and in 1641 went to La Rochelle to embark. While there she met Dauversière, who was founding a religious community to maintain a hospital at Montreal in honor of St. Joseph, and determined to go with Maisonneuve (q.v.) and his men. Three other women at the last moment joined the expedition, which spent the first winter at Quebec, going to Montreal in 1642. The hospital was built with funds furnished by Madame de Bullion, and Madamoiselle Mance was in charge. She became second only to Maisonneuve in importance to the colony, as many executive details fell to her, in addition to her care of the sick and her work for the conversion of the Indians. She made several trips to France to secure aid in the work and stimulate the flagging zeal of the Associates of Montreal. She was also influential in bringing about the cession of the island to the Sulpicians, when the Associates were about to disband in 1657 (though the cession did not take effect for several years), and served as head of the Sisters of St. Joseph until her death. Consult Faillon, *Vie de Mlle. Mance et histoire de l'Hôtel Dieu de Villemarie dans l'île de Montreal en Canada* (Villemarie, 1854).

MANCH, mänsh, or **MAUNCH** (OF., Fr. *manche*, sleeve, from Lat. *manicæ*, sleeve, handcuff, from *manus*, hand). A frequent charge in English heraldry, meant to represent a sleeve with long pendent ends, of the form worn by ladies in the reign of Henry I. See HERALDRY.

MANCHA, män′chȧ, LA. A district of Spain, in the provinces of Ciudad Real and Albacete, forming the southernmost part of the Kingdom of New Castile (Map: Spain, D 3). It is a level, arid, and treeless plateau, nearly 2000 feet above sea level, and for the most part covered with esparto grass, which is an article of export. The upper waters of the Guadiana run through the territory with a sluggish flow. In spite of the dryness of the region, it produces considerable quantities of wine and grain. It is celebrated in Cervantes' novel *Don Quixote de la Mancha*.

MANCHE, mäɴsh, LA. A maritime department in the northwest of France, part of the old Province of Normandy (Map: France, N., D 3). Area, 2476 square miles. Pop., 1901, 491,372; 1911, 476,119. It derives its name—signifying sleeve—from the configuration of the English Channel (Fr. *La Manche*), which borders its shores on three sides. It has a shore line of 200 miles, the chief harbor being Cherbourg. The surface of the department is irregular, being traversed from north to south by the Cotentin Hills. The Vire, the Douve, and the Selune are the chief rivers. Flax, hemp, and fruit are extensively cultivated, and apples are grown. Horses of the famous Norman breed and excellent cattle and sheep are raised. Capital, Saint-Lô. See Plate of MONT ST. MICHEL.

MANCHESTER, măn′chĕs-tẽr. A county borough and city geographically in southeastern Lancashire, England, on the small rivers Irwell, Medlock, and Irk, 31 miles east-northeast of Liverpool and 188 miles north-northwest of London by rail (Map: England, D 3). It is practically contiguous, on the west, with Salford, itself a county borough, from which it is separated only by the Irwell. Manchester is an inland port, on the Manchester Ship Canal, and the great centre of cotton manufacture. The city is irregularly built, with Market Street, extending southeast from the Irwell, as its central thoroughfare. The central part of the city is given over to business; the east side is characterized by workshops and factories; the south side is a distinctively residential district, which in its outer portions becomes semirural. Manchester exhibits almost every urban aspect, from the attractiveness of the outlying lawns and gardens to the squalor and congestion of the slums. The principal public buildings include the immense town hall (1877), in a form of Gothic, having a main tower 286 feet high and built at a cost of more than a million pounds sterling; the Royal Infirmary, which was founded in 1752 and whose new building was opened in 1909; the Royal Exchange (1869), in the Italian style, whose meeting hall is one of the largest in England; the Royal Institution (Corporation Art Gallery), in Doric style; the Free Trade Hall, in Lombardo-Venetian style, which will seat 5000 persons; the Assize Courts (1864), in an early English and Decorated composite; the Memorial Hall; the Athenæum; and the Doric branch Bank of England. Many of the mercantile establishments are splendid structures. Among the ecclesiastical buildings are the cathedral, commonly called "the Old Church," a good example of the Perpendicular style, though built (in the early part of the fifteenth century) as a parish church (it was restored in the nineteenth century, and the tower virtually rebuilt); and the Roman Catholic (Jesuit) church of the Holy Name, a modern Gothic structure notable for its costly decoration. There are many other churches, the nonconformist far outnumbering the Anglican. Of numerous public monuments the most notable are a Prince Albert memorial in Albert Square, a bronze statue of Richard Cobden in St. Ann's Square, one of Cromwell (unveiled in 1875) at the foot of Victoria Street, and statues of Queen Victoria, Watt, Dalton, and Peel in Piccadilly.

Manchester is encircled by populous suburban municipalities, connected by rail and tramways; numerous bridges connect it with Salford. Both boroughs were enfranchised by the Reform Bill of 1832, Manchester returning two members and Salford one member to Parliament. The redistribution of seats in 1885 gave Manchester six members and Salford three. Manchester was incorporated as a municipal borough in 1838 and Salford in 1844. Manchester was made a bishopric in 1847, received the title of city in 1853, and became a county borough in 1889. In 1885, in 1890, in 1894, in 1901, in 1903, in 1904, and in 1909 the municipal boundaries were enlarged and the suburbs of Bradford, Rusholme, Blackley, Moston, Newton Heath, Openshaw, Gorton, Prestwich, Moss Side, Withington, Levenshulme, etc., were included within the city limits. For purposes of administration, Manchester is divided into 34 wards and is governed by a city council and board of aldermen; the mayor, who received the title of lord mayor in 1893, is elected by the council and receives no salary. The council elects from its own members standing committees which supervise the various municipal departments. Manchester derives from its city rates more than enough for its municipal needs, taken together with the profitable undertakings which the city owns. Until 1847 the water supply was controlled by a private company and was so unsatisfactory that the city took it over. Large sums were expended during the next 28 years in enlarging the plant. In 1874 Parliament passed a bill authorizing the city to get a new supply from Thirlmere, a lake 96 miles distant at the foot of Helvellyn on the southeast border of Cumberland, which was subsequently acquired by the city. The works, from 1848 to their completion in 1884, cost £3,148,000. The daily consumption is over 38,000,000 gallons. Manchester possesses the oldest municipal gas works in the world, its ownership dating from 1807. The city supplies with gas several of the adjoining towns and derives a considerable annual profit from the works. Its electric-light plant, opened in 1893, is also a successful municipal enterprise. Manchester owns its street railways, but does not operate them, leaving that to a private company in consideration of a rental equal to more than 10 per cent upon the city's investment. The city exercises a strict supervision over all the details of the company's work.

Manchester owes its growth and prosperity very considerably to its water communication with the sea. In 1721 a plan was made by Thomas Steers, and subsequently carried out, for extending over the Irwell, by means of locks and weirs from Warrington to Manchester, the barge navigation which existed between Liverpool and Warrington. In 1761 a canal, built by James Brindley for the Duke of Bridgewater (1736–1803) from the duke's collieries at Worsley to Manchester, was opened to traffic. This canal was carried in an aqueduct over the Irwell at Barton and was the first canal in England which throughout its course was independent of a natural stream. In 1772, the Duke and Brindley completed a canal from Manchester to the Mersey at Runcorn which opened competition with the Irwell-Mersey navigation to Liverpool. Both routes accommodated barges of 50 tons. The Manchester-Runcorn canal was about 28 miles in length, nearly three times as long as the Worsley-Manchester. Although to these facilities for trade was subsequently added the Liverpool and Manchester Railway, the need of a ship canal ultimately asserted itself. Plans were submitted in 1825 and 1840, but the movement for a ship canal which was finally successful did not begin until 1882. The undertaking, opposed by Liverpool and the railway, received parliamentary sanction in 1885, and work began in November, 1887. The Manchester Ship Canal was opened to traffic in January, 1894; the official opening ceremony took place May 21, 1894, when Queen Victoria visited Manchester. The canal is 35½ miles long. It begins at Eastham, on the Cheshire side of the Mersey estuary, about 6 miles above Liverpool, and passes in or near the estuary to Runcorn, 12¾ miles; thence to Latchford, a part of Warrington, in Lancashire, it is inland, 8¼ miles; from Latchford, where are the first locks, the canal continues to Manchester, 14½ miles. The minimum bottom width of the canal is 120 feet; the minimum depth 28 feet (originally 26 feet). Both sides are faced with heavy coursed stone. The total excavation, including docks and subsidiary work, was more than 54,000,000 cubic yards, of which nearly one-fourth was sandstone rock. The expenditure to 1900 on the works, including equipment, was £10,328,000; the purchase of the old canal navigations, interest, other expenses, etc., increased the total outlay to £15,248,000. At Barton the ship canal crosses, on a lower level, the aqueduct of the Bridgewater Canal. The passage of ships was made possible by introducing into the Bridgewater Canal a swing aqueduct. The fixed aqueduct is the first navigable aqueduct in England, and the swing aqueduct the first of its kind in the world. The movable portion of the swing aqueduct, including the water, weighs 1600 tons. The ship canal has enormously increased Manchester's industrial and commercial activity. The traffic of toll-paying merchandise has steadily increased. In 1894 this amounted to 925,659; in 1900, 2,784,843; in 1910, 4,618,070; and in 1913, 5,457,218 tons. The receipts for these years amounted to £97,901, £290,830, £555,735, and £654,937 respectively. Manchester has 6 miles of quayage and dock accommodations of 100 acres. To make its provisions for all the commercial and industrial facilities complete, the city takes considerable pains to keep up a good supply of efficient and highly skilled craftsmen, mechanics, foremen, etc., for its diverse industries. All the chief technical schools, formerly conducted by private individuals, have been consolidated under a municipal management. Manchester has many educational institutions. The oldest of these is the grammar school founded by Hugh Oldham (died 1519), who was Bishop of Exeter and a noted benefactor of Corpus Christi College, Oxford. The conveyances of the property which constitutes the endowment of the school bear date of 1515 and 1525. The school has 250 free scholars and others paying fees. The second-oldest institution is the Chetham Hospital and Library, a boys' school whose foundation was provided by will of Humphrey Chetham (1580–1653), a merchant, woolen manufacturer, and money changer of Manchester. There are also another grammar school, endowed by William Hulme (1631–91), the Nichols Hospital (1881) for the education of orphan boys, and three high schools for girls. The municipality provides many elementary schools, a school of art, a school of technology, a teachers' college, various special schools, etc. In 1846 John Owens (born 1790), a Manchester merchant, left the residue (£96,655) of his personal estate to found a boys' college for secular instruction. (See MANCHESTER, UNIVERSITY OF.) There are several denominational colleges in Manchester. Manchester was among the first towns in England to adopt the Free Libraries Act, which allows an appropriation of a penny in the pound on the local assessment for parks, libraries, and museums; and here also was established the first free lending library in England. Numerous branch lending libraries and a museum have since been established in Manchester, and several branch lending libraries and an excellent museum in Salford.

The parks of Manchester are 39 in number, covering an area of 1103 acres. The chief are Heaton Park, 692 acres; Boggart Hole Clough, 76 acres; and Queens, Philips, Alexandra, Peel, and Whitworth parks. Like Glasgow, it has a large precipitation and filtration plant for the utilization of its sewage (for description of plant, see GLASGOW) and for the prevention of pollution of its river. The fertilizers thus obtained bring a good price. The garbage is burned up in the furnaces, and the noncombustible part is used to fill in outlying low ground belonging to the city, which is thus converting it into good building land, which sells at an advanced price. There are municipal bathing establishments, markets, abattoirs, and workmen's dwellings. The city lets several hundred dwellings in tenements, as well as private cottages, to workmen's families, the rents being $2.50 per room per month, and about $5 per month for a four-room cottage. The death rate in Manchester is quite high, being, according to the statistics for 1911, 26 per 1000 of population, or much higher than in London or Glasgow. As an industrial centre, it is one of the oldest, as well as one of the most important, in England. The chief industry is cotton spinning, weaving, and manufacturing, including calico printing, bleaching, and dyeing; there are also considerable manufactures of silk and mixed goods, of small wares, of machinery and tools, of paper and chemicals. Manchester is a depot for all kinds of textile fabrics. In the foreign and colonial trade tonnage entered at Manchester (including Runcorn) in 1902 was 1,002,336, and cleared 713,172; in 1907, 1,363,859 and 1,161,115; in 1912, 1,335,415 and 1,079,736. The imports of Manchester (including Runcorn) were valued at £17,620,772 in 1902, and the exports £8,310,436 (of which £8,001,563 domestic); in 1907, £30,402,229 and £16,826,627 (£15,754,398); in 1912, £35,111,128 and £21,606,841 (£21,182,625). Manchester is the seat of an American consul.

The population of Manchester increased rapidly during the nineteenth century. Starting with a population of 75,000 in 1801, it grew to 126,000 in 1821, 303,000 in 1851, 644,873 in 1901, and 714,333 in 1911. The area of the city at the 1911 census was 21,645 acres. The adjoining county borough of Salford, with an area of 5202 acres, had in 1901 a population of 220,957 and in 1911 231,357. Thus, the combined population of the two boroughs was 865,830 and in 1911, 945,690. The suburban population is enormous.

Roman remains have been found in great numbers at Manchester, but the history of the place can be traced only to Anglo-Saxon times, the name Mamcester, or Mameceaster, appearing in the *Anglo-Saxon Chronicle* in 923. The town suffered much from the Danes, but prospered nevertheless. In the thirteenth century fulling mills were at work there. In 1301 Manchester became a free borough with a considerable degree of self-government. It thrived especially after the fourteenth century, and about 1650 was a busy town, with nearly 6000 inhabitants. During the Civil War it was held successfully for the Parliament, but in the eighteenth century it became strongly Jacobite and participated in the rebellions of 1715 and 1745. In the early part of the nineteenth century Manchester was prominent in the liberal and reform agitation, and was the scene, in 1819, of the so-called Peterloo Massacre (q.v.). After 1832 it was the headquarters of the free-trade movement, and gave its name to the famous Manchester School of Economy.

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MANCHESTER. A town in Hartford Co., Conn., 9 miles east of Hartford, on the Hockanum River and on the New York, New Haven, and Hartford and the South Manchester railroads (Map: Connecticut, F 2). It was taken from East Hartford and incorporated in 1823, and includes the villages of Manchester, South Manchester, Buckland, Manchester Green, and Highland Park. The town has the great Cheney silk mills, employing 4500 persons, paper mills, cotton and woolen mills, and manufactories of electrical appliances, soap specialties, machinery, needles, and tinware. There are public libraries in the villages of Manchester and South Manchester. First incorporated in 1823, Manchester was reincorporated in 1907, and has adopted a modified commission form of government by which seven selectmen act as a board of supervisors. Pop., 1900, 10,601; 1910, 13,641; 1914 (U. S. est.), 14,935; 1920, 18,370.

MANCHESTER. A city and the county seat of Delaware Co., Iowa, 47 miles west of Dubuque, on the Maquoketa River and on the Illinois Central and the Manchester and Oneida railroads (Map: Iowa, F 2). It has a Carnegie library and, in the suburbs, a United States fish hatchery. The city is the commercial centre of the adjacent farming, stock-raising, and dairying country, and manufactures flour, brick and tile, etc. The industrial interests are promoted by good water power. Manchester owns its water works. Pop., 1900, 2887; 1910, 2758.

MANCHESTER. A town including several villages in Essex Co., Mass., 9 miles northeast of Salem, on Massachusetts Bay and on the Boston and Maine Railroad (Map: Massachusetts, F 2). It is a popular summer resort, one of the leading attractions being a "singing beach." It has a public library in the Coolidge Memorial Library Building, and manufactories of furniture. The town owns and operates its water works and sewer plant. Pop., 1900, 2522; 1910, 2673.

Manchester was settled probably as early as 1630, and was known as "Jeffry's Creek" until 1645, when it was incorporated as a village under its present name. It first became a summer resort about 1845, when Richard H. Dana built a summer cottage here. Consult Lamson, *History of the Town of Manchester, 1645–1895* (Manchester, 1895).

MANCHESTER. The largest city of New Hampshire, and one of the county seats of Hillsboro County, 18 miles by rail south-southeast of the State capital, Concord, and 56 miles by rail north-northwest of Boston, Mass., on the Merrimac River, at its confluence with the Piscataquog, and on the Boston and Maine Railroad (Map: New Hampshire, G 8). It extends along both banks of the two rivers. An immense amount of water power for manufacturing is derived from the Amoskeag Falls (about 55 feet) of the Merrimac by means of a carefully projected system of canals, though steam is used also in a number of the mills. The most extensive industries are cotton and woolen cloth manufacturing. In 1915 there were 36 mills with a combined annual output of 246,000,000 yards of cotton and 2,000,000 yards of woolen cloth. They employed about 15,000 hands and their total output had a value of $35,000,000. Manchester is also noted for the production of boots and shoes; about 7500 persons are employed in this industry. There are also paper and woolen mills, fire-engine and locomotive works, needle and knitting-machine factories, hosiery and underwear factories, carriage and wagon works, tanneries, and manufactories of cigars, brushes, beer, lumber products, furniture, etc. The combined industries of the city, which employ about 25,000 persons, represent a capital of nearly $26,000,000 and have an output valued at $46,000,000.

The city is well laid out with fine, broad streets, and has a handsome United States government building, county courthouse, State industrial school, Roman Catholic cathedral, a large public library, and 15 public parks, in all embracing 200 acres. Other noteworthy features are the Notre Dame, Sacred Heart, and Elliott hospitals, Women's Aid Home, Weston Observatory, Holy Angels' Convent, and the Gale, Masonic, and Children's homes. Manchester's income in 1912–13 was $2,268,000, while its payments amounted to $2,392,000, the chief items of expenditure being $202,000 for education, $139,000 for the fire department, $84,000 for sanitation, $77,000 for the police department, and $58,000 for the water works, which are owned and operated by the city, having been built in 1873 at a cost of over $1,500,000. Pop., 1870, 23,536; 1880, 32,630; 1890, 44,126; 1900, 56,987; 1910, 70,063, including 29,692 persons of foreign birth and 36 negroes; 1914 (U. S. est.), 75,635; 1920, 78,384.

MANCHESTER. A town and one of the county seats of Bennington Co., Vt., 53 miles by rail northeast of Troy, N. Y., on the Battenkill River and on the Rutland Railroad (Map: Vermont, B 7). It is a popular summer resort, situated amid fine mountain scenery, at the base of Mount Equinox (3847 feet above sea level), which commands a superb view, and has the Skinner Memorial Library and the Burr and Burton Seminary. Most of the sidewalks are paved with marble. The town is surrounded by a productive farming region, and has large lumber and marble interests and manufactures of fishing rods and ginger champagne. The water of the mineral springs here is exported. Before the organization of Vermont, Manchester was for many years claimed by both New Hampshire and New York. The town was incorporated in 1761 and the village in 1900. Pop., 1900, 1955; 1910, 2044. Consult Munson, *The Early History of Manchester* (Manchester, 1876).

MANCHESTER. Formerly a city in Chesterfield Co., Va., annexed to Richmond in 1910. It has important agricultural and coal-mining interests, and there are large flouring mills, cotton mills, foundries, paper mills, tanneries, brickyards, glass, furniture, and woodenware factories, and repair shops of the Southern Railway. Good water power is afforded by the James River, which has a fall of 100 feet in less than 60 miles.

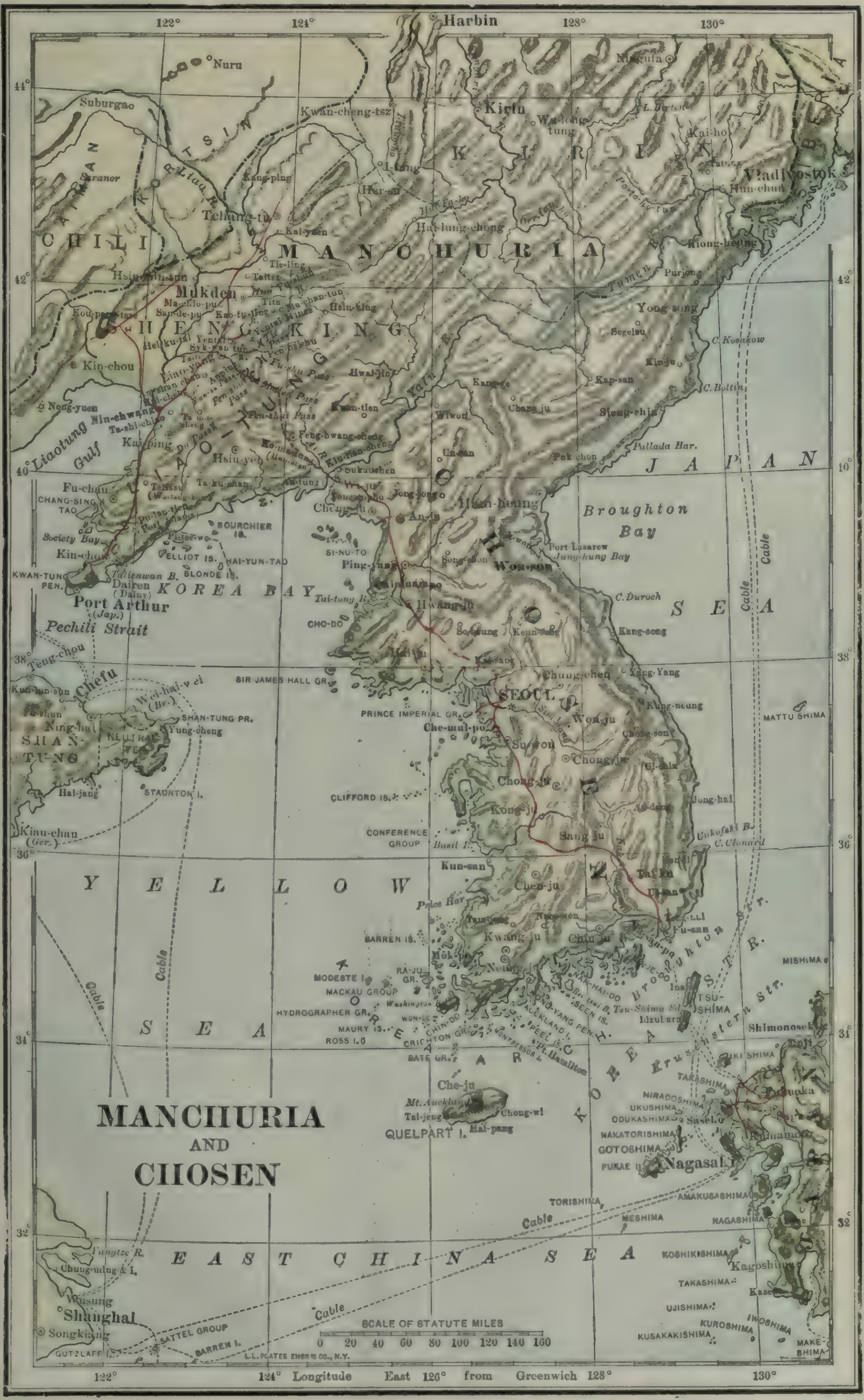
MANCHESTER, UNIVERSITY OF, Manchester, England. A university which had its origin in the foundation, by the will of John Owens, of Owens College to provide higher education without denominational restrictions. Work was begun in 1851 in a house formerly the residence of Richard Cobden (q.v.). The successful growth of the college dated from the sixties. In 1872 the college secured the incorporation of the Manchester Royal School of Medicine. At the same time the existing site became inadequate and new buildings were erected on another site, which has again outgrown the present requirements. Women were admitted to special courses of lectures in 1874, but were not fully admitted as matriculated members until 1883. In 1880 Owens College became one of the constituent members, together with what are now the universities of Leeds and Liverpool, of the Victoria University. On the dissolution of that body Owens College became in 1903 the Victoria University of Manchester. While the aim of the university is so far as possible to meet the local needs, and although it relies to a great extent on local support, it has attained an international reputation in certain fields of work. The university was one of the first in the country to establish a course and degree in commercial subjects. The university has developed strong departments not only in the sciences but also in English, history, and education, while its medical facilities have been greatly supplemented by the establishment of an excellent hospital in its vicinity. In several departments, such as music, theology, and technology, the university coöperates with several local institutions. The financial support is derived from endowments, fees, and grants from the local and central authorities. In 1913–14 there were 256 members on the faculty and 1840 students.

MANCHESTER COPPY. See CANARY.

MANCHESTER SCHOOL OF POLITICAL ECONOMY. The name applied to a group of English economic writers under the leadership of Richard Cobden and John Bright, who advocated principles of free trade and *laissez faire*. In 1820 the merchants of Manchester became prominent as defenders of free trade, and in 1838 the Chamber of Commerce of Manchester issued a vigorous denunciation of the protective principle. The immediate object of attack was the Corn Law; and the Anti-Corn Law League, organized in 1839 by the Manchester free traders, carried on an educational campaign which drew the attention of the whole world. The term Manchester school has come to be applied as a term of reproach by writers of the German historical school of economics and by practical protectionists. It must be admitted that writers of the Manchester school often manifest a tendency to limit unduly the field of governmental activity and to overrate the beneficence of unrestricted competition. See the articles FREE TRADE; CORN LAWS.

MAN'CHINEEL' (Fr. *mancenille, manzanille*, from Spanish *manzanillo*, manchineel, dim. of *manzana*, apple, probably from Lat. *matiana* (*mala*), *matian* (apples), nom. pl. of *Matianus*, relating to Matius, from *Matius*, name of a Roman gens), *Hippomane mancinella*. A tropical American tree of the family Euphorbiaceæ. Its acrid milky juice is reputed very poisonous. The tropical American Indians poison their arrows with it. Its perfumed fruit is so acrid as to be inedible.

MANCHURIA, man-cho͞o'rē-ȧ (the land of the Manchus). The northeastern part of the Chinese Republic, situated east of Mongolia and the Argun River (which formerly traversed Manchurian territory), south of the Amur River (which separates it from Siberia), and west of the Usuri, which separates it from Primorsk (Maritime Province) or Russian Manchuria (a Chinese possession until 1860). It is bounded on the southeast and south by Chosen (Korea), the Bay of Korea, and the Gulf of Liaotung, and is included between the parallels of 39° and 53° 30′ N. and the meridians of 117° and 135° E. As already indicated, it was formerly much more extensive than it is now, Russian encroachments (beginning about the middle of the seventeenth century) having gradually narrowed it down to its present officially



MANCHURIA
AND
CHOSEN

estimated area of 363,600 square miles. The country is known to the Chinese as Tung San Sŭng (or Shêng), i.e., the Three Eastern Provinces, referring to its three administrative divisions: (1) the Province of Tsitsihar or Heilungkiang in the north, with an estimated area of 202,000 square miles; (2) Kirin (q.v.) in the centre, the original home of the Manchus, area 105,000 square miles; and (3) Shingking or Fung-t'ien-fu in the south, area 56,000 square miles. The last one is, strictly speaking, no part of Manchuria, having been a Chinese province before the rise of the Manchus.

Topography. The whole eastern part of the country bordering on Chosen and Russian Manchuria is occupied by huge mountain masses with many fertile valleys. The general trend of the ranges is from northeast to southwest, and the backbone of the whole is the Shan-a-lin or Long White Mountains. In the northwest, within the loop formed by the Argun and the Amur, is found the main mass of the Greater Khingan (or Hingan) system, stretching southward into Mongolia, but sending out many spurs and ridges both westward towards Siberia and eastward through Tsitsihar, forming in the centre of that province the hills and plateaus of the Lesser Khingan ranges. South of this (extending as far as the Gulf of Liaotung) and west of the Shan-a-lin ranges lies the great plain of the country, diversified by hill and dale, with occcasional swampy regions, but of great agricultural value, producing large crops of pulse, barley, wheat, millet, maize, rice, cotton, indigo, tobacco, sesame, opium, ginseng, rhubarb, etc., and capable of sustaining immense herds of cattle. It has been estimated that at present only one-fifth of the arable land is under cultivation.

The mountains are still well covered with forests, especially in the northern province, but those bordering on Chosen are being rapidly denuded to supply the needs of China. Tigers, wolves, bear, deer, foxes, martens, and other fur-bearing animals abound, and hunting and trapping are important occupations.

Hydrography. The most important rivers drain northward to the Amur (q.v.). The two main drainage basins are those of the Sungari and the Usuri, both rising in the Shan-a-lin ranges. The former receives in its course the Nonni and the Hulan from the Khingan ranges, the Hurka or Mutan-ho from the Shan-a-lin, and many other streams. The Argun is navigable for 460 miles, the Sungari for 700 (not including its tributaries), and the Usuri for 250, but navigation is restricted by treaty to Russian and Chinese vessels. The south-flowing rivers are the Liao (400 miles), a continuation of the Shira-muren from Mongolia; the Ta-yang, entering the Gulf of Pechili at Takushan; and the Yalu-kiang (between Manchuria and Chosen), which falls into the Bay of Chosen.

Mineral Resources. Nothing is known regarding the geology of Manchuria, but its mineral wealth is known to be great. Gold is found in all the provinces, most abundantly in Tsitsihar. It is mined by the government along the Sungari near Sansing, as well as along the Hurka in the Province of Kirin. Silver, copper, lead, iron, and soda are worked to some extent. Coal is also found, and the Fushun coal mine, which forms part of the Japanese government's investment in the Southern Manchuria Railway Company, is believed to be one of the richest in the world. Its strata are from 100 to 120 feet deep and about 10 miles broad.

The Climate exhibits great extremes of temperature, but is healthful, and, being uninfluenced by the southwest monsoon, it is dry. The rainfall is only about 13 inches in the south. The minimum winter temperature varies from 7° F. in the north, and the summer temperature sometimes reaches 95° F. The rainy season occurs in July and August.

Transportation. There are many so-called highways, of which the most important runs from Peking to Siberia via Chinchowfu, Mukden, Kirin, Petuna, and Tsitsihar. However, in some seasons of the year, during thaw or continued rains, these roads are almost impassable. The chief movement of crops to the southern ports takes place in the winter, when the country is frozen solid. The absence of good roads and the inability of the railway lines completely to feed the huge territory make river transportation a necessity, and in open season boats and junks travel to every part of the three provinces, while in winter the rivers furnish ice ways for sledge traffic, accommodating freight and passengers.

There are (1915) three railway systems in Manchuria: (1) The Russian line, known as the Chinese Eastern Railway, a continuation of the Trans-Siberian system, runs southeast for 92 miles to Suifenho, and thence to Vladivostok. Construction on the main line was begun in 1897, and in 1901 it was opened at a cost of 350,000,000 rubles. In 1912 there were 1,660,533 passengers carried and 3,390,773 tons of freight. (2) The South Manchurian Railway, opened in 1907, was originally part of the Russian system, but was transferred to Japan by the Portsmouth Treaty of 1905. The main line runs south from Kuanchengtze (Changchun) for 439 miles to Dairen (Dalny). In 1912 it carried 3,392,039 passengers and 4,407,734 tons of freight. (3) The Peking-Mukden (Chung-Feng) Railway, of the Chinese government railways, which has a terminal at Peking, enters Manchuria at Shanhaikwan and runs north to Mukden. The road was opened in 1903. In addition to these roads and their branches, there are several railways planned, the most important of which are the Kirin-Hungchun line, a Sino-Japanese enterprise, and a private Chinese line from Harbin to Shuhiu.

By virtue of the land, mining, and other grants along their respective railways, Russia and Japan are making systematic efforts to develop Manchurian commerce, industry, and colonization. The centre of Russian activity is at Harbin (q.v.), and along the entire Eastern Chinese Railway the Russians have established numerous sugar and flour mills, tanneries, distilleries, oil mills, mines, etc. The Jalainor mines in 1913 produced 142,857 tons. Russian population in north Manchuria has increased (1913) from 45,000 to 56,000. Foreign firms in 1912 numbered 303, and increased to 1241 in 1913. Three of these firms are American. The Japanese in south Manchuria organized the South Manchurian Railway Company by Imperial ordinance of June 7, 1906. This company, which has a capital of £20,000,000, controls the steamship line between Dairen (Dalny) and Shanghai, manages Dairen harbor, supplies that port and other places with gas and electricity, and operates the great Fushun mines, the output of which in 1912 was 1,470,150 long tons. At

Yengtai the company mined 43,104 tons. The Penhsihu mines, on the Mukden-Antung Railway, are operated by a Sino-Japanese concern; output in 1912 was 160,000 tons. Here are also iron mines, and it is estimated that the three blast furnaces at the Penhsihu colliery can turn out 120,000 tons per annum. The South Manchurian Railway Company is especially active in establishing railway hotels and towns along the line, including numerous Y. M. C. A's; also in developing the resources of the railway area. These are considerable when it is remembered that Manchuria has one of the richest soils in the world. The company has £14,000,000 sterling in 5 per cent debentures on the London market, with the capital and interest guaranteed by the Imperial Japanese government.

Commerce. The trade of Manchuria for 1912, according to returns of the Chinese Maritime Customs, was $132,265,545. Of this, foreign countries received 62 per cent and Chinese ports 38 per cent. The trade of each Manchurian open port for 1912 was as follows:

OPEN PORTS	1912		
	NET IMPORTS		Exports
	Foreign goods	Native goods	
South Manchuria:			
Antung	$3,199,297	$724,081	$3,966,255
Chinwangtao	1,408,292	122,669	2,526,266
Dairen (Dalny)	20,849,176	2,628,297	21,762,258
Newchwang	17,516,471	6,943,748	19,680,509
Tatungkou	25,501	14,230	210,977
Total	$41,998,737	$10,433,025	$48,046,265
North Manchuria:			
Aigun	$497,010	$173,375	$165,409
Harbin	Reëxports exceeded imports		4,456,093
Hungchun	245,878	109,345	193,805
Lungchingtsun	252,393	....	85,832
Manchouli	8,098,658	892,530	1,399,768
Sansing	122,592	367,848	1,176,946
Suifenho	5,102,254	....	10,847,782
Total	$14,318,785	$1,543,098	$18,325,635
Grand total	$56,317,522	$11,976,123	$63,971,900

As computed in Haikwan taels, the total revenue of the Manchurian ports for 1912 was 3,875,696, a decrease from 1911 of 120.530 Haikwan taels. The exchange rate in 1912, however, was $0.716, owing to the high rate of silver exchange, whereas in 1911 it was $0.65 United States currency. Thus, when translated, revenue for 1912 was equal to $2,774,998, a gain of $177,451 over 1911. Of this revenue, import duties furnished $1,123,175 and export duties $1,457,393.

Although the Chinese revolution was not active in Manchuria, yet conditions were disturbed because 29 per cent of the import and 36 per cent of the export trade of the territory was domestic in 1911. In 1912 there was a considerable decrease in native importations. The European War of 1914 affected Manchuria through the activities of the German cruisers in Pacific waters and the siege of Tsingtau, the German concession in Shantung Province.

A comparison of South Manchurian with North Manchurian ports shows that the former received 74 per cent of foreign imports and 87 per cent of native imports in 1912 and 71 per cent of total exports. The two big ports of Manchuria are Dairen, in 1912 ranking fifth of all Chinese ports in total value of trade, and Newchwang, ranking eighth, both South Manchurian ports.

The principal foreign imports are clothing and hats, cotton goods, iron and steel manufactures, railway plant and material, kerosene (mainly American), wines and liquors, matches, tobacco, tea, and woolen goods. Native imports consist mainly of animals, boots and shoes, breadstuffs, coal, cotton goods, earthenware and pottery, matches, timber, and tobacco. Principal exports are beans and peas, bean cake, bean oil, coal, eggs, flour, seeds, skins (marmot, fox, sheep, goat, and squirrel), and timber. Exportations to Chinese ports (interprovincial) are mainly cotton yarn, American flour and kerosene, beans and bean cake, cereals, earthenware and pottery, mats, and oil.

Japan holds a large share of the trade in cotton goods, some of these articles exclusively. Japanese firms are materially aided by the use of Japanese money in south Manchuria, along the South Manchurian Railway. The Japanese also exchange a considerable amount of goods by barter. They have made a successful commercial invasion of north Manchuria, where they have established a Japanese bank. American kerosene, flour, and sewing machines find a good market in Manchuria.

The leading crops are beans, tobacco, and kaoliang. In 1912 the bean crop was 3,284,929 tons. From November, 1911, to November, 1912, a total of 351,000 tons of beans was exported via Suifenho and Vladivostok, 30,000 tons to Japan, and the remainder to Europe. At the port of Dairen in the Leased Territory (Japanese) 19,421 tons of beans and bean cake were exported to Hongkong, the Straits Settlements, and Europe, and 101,903 tons to Japan, while 61,304 tons were shipped to Chinese ports. A total of 15,857 tons of bean oil was sent from the port of Dairen to Europe, and 13,973 tons to Chinese ports. The bean cake shipped from Dairen goes almost exclusively to Japan. Tobacco is the next best money crop. It is grown in the upper Sungari valley and about 125 miles northeast of Mukden. The emporium of the tobacco trade is Kirin City, and the chief markets the three Manchurian provinces, Chili, and Shantung. In 1912 the value of the crop was estimated at $4,000,000. In 1912, 3,807,740 tons of kaoliang were raised. Kaoliang is a grain which is little exported, and is used as the chief grain food of the native Chinese population in Manchuria, and also as the principal grain food for animals. It is almost as handy a product as bamboo. The stalks are employed in the construction of houses, fences, and for use as fuel; the leaves furnish material for the manufacture of hats, baskets, and brooms. In 1912, 2,309,800 tons of millet were raised. There has lately been a large increase in the exportation of glutinous millet to Chosen and Japan, where it is used by the poorer people as a substitute for rice, which is at present high in price. There have been successful experiments of rice growing by the Japanese in south Manchuria, and rice farming is growing in importance along the South Manchurian and the Mukden-Antung railways. The 1912 crop was equal to 210,000 bushels. The rice is not transplanted, but is grown directly in the paddy during early May and harvested in late August or early September. During 1912 there was an increase of opium imports to the port of Dairen from 2973 to 7375 pounds. Importation was permitted in the Japanese Leased Territory until Jan. 1, 1916, when it was discontinued. Elsewhere in Manchuria opium is prohibited. The other important crops in 1912, estimated in tons, were: barley, 364,369; corn, 895,860; rice, 137,232; sesame seeds, 18,142; wheat, 1,105,048.

Population. Estimates of population vary from 14,900,000 to 29,400,000. Hosie places the total at 17,000,000; Little at 21,000,000; H. B. Morse at 16,000,000. The Michengpu (Chinese census) of 1910 gives the number as 14,917,000, which is probably too low. The Maritime Customs estimate for 1910 is 17,000,000, and, for 1913, 19,290,000. The population of Shengking Province (Fengtien) is estimated at 10,312,341; Kirin Province at 6,000,000; and Heilungkiang (the Amur Province) at 1,500,000. Chinese form the overwhelming proportion of the population, and the Manchus about one-tenth of the total. In the last 10 years there has been a considerable influx of Japanese and Russians, the former in the lower and the latter in the upper half of the territory. Each year there is an influx of Chinese laborers from Chili and Shantung provinces, and many of these undoubtedly remain. This immigration is mainly along the Peking-Mukden (Chinese) Railway, and also to the ports of Yingkow, Dairen, and Antung on the Chosen frontier.

Of the treaty ports, Harbin (q.v.) has an estimated population of 68,000; Newchwang (q.v.), 75,000; Antung (q.v.), 160,000; Sansing, 30,000; Dalny (q.v.), 75,000; Aigun, 60,000; Manchouli, 10,000; Tatungkow, 10,000; Hungchun, 8000; Lungchingtsun, 7000; Suifenho, 5000. Other important Manchurian towns are Tsitsihar, 60,000, a place where cattle fairs are held in September and October; Hulan, 30,000, with half a hundred oil mills; Baiansussu, 30,000, which has 18 distilleries and 30 oil mills; Kirin (q.v.), an important centre for tobacco, furs, and lumber trade; Petuna, 30,000, with rope and cotton-goods manufactures; and Kuanchengtze (Changchun), 80,000, one of the most important cities in all Manchuria, lying 80 miles west of Kirin, and the distributing point for the trade of northern Kirin and Heilungkiang provinces. Here also are found distilleries, oil mills, and tobacco industries. Mukden (q.v.) is the centre of a rich agricultural district, has a population of 250,000, and is theoretically open to foreign trade. Liaoyang, a Russian town before the Russo-Japanese war, has since been made, like Dairen, one of the centres of Japanese activities in south Manchuria. Port Arthur (q.v.) is not used by Japan for commercial purposes, but is of value as a strongly fortified naval base.

The government of Manchuria is vested in the central authority of the Chinese Republic at Peking, which is represented locally by three provincial governors, one for each of the Manchurian provinces. In finance, justice, and the ordinary governmental routine, these governors have practically unlimited powers, but foreign relations are delegated entirely to the administration at Peking. The Liaotung Peninsula (Kwantung), where Port Arthur and Dairen are situated, and which is known as the Leased Territory (area 1219 square miles, population in 1912 of 501,767, including 45,356 Japanese), is under the control of Japan until 1923, when the original Russian lease runs out and the land reverts by existing treaty agreement to China.

History. Many references are found in Chinese history to the savage tribes inhabiting this region even as early as the eleventh century B.C. In 712 we find a chieftain named *Ta*, whose tribe dwelt to the north of Chosen, receiving from the Chinese Emperor the title of Prince of Pohai. Later his descendants threw off the Chinese allegiance and established an independent kingdom with a centralized government and no fewer than five royal residences. Later still arose the Khitan, whose seat was in the valleys of the Hulan. They conquered eastern Mongolia, waged war on China, established a dynasty there known as the Liao (907), overthrew the Pohai in 926, and annexed their territory. In 1125 the Khitan were conquered by the Neu-chin or Jurchin, whose original seat was between the upper Sungari and the Hurka, and who possessed themselves of Manchuria, Mongolia, and north China, and there set up the Kin or Golden dynasty. Driven out of China in the thirteenth century by Kublai Khan, the Jurchin became broken up into a number of independent tribes which were later welded into one kingdom by Nurhachu (born 1559), whose chief seat lay in the south of the Long White Mountain about 100 miles east of Mukden, then an important Chinese city. He was the seventh in descent from the miraculously conceived Aisin Gioro Bukuli, the ancestor of the family until 1912 on the throne of China, and the first to apply to his tribesmen the epithet *Manchu*, "clear" or "pure," by which the last reigning dynasty in China is known to history—*Ta Ts'ing Ch'ao*, "the Great Pure." In 1616 Nurhachu took the title of *T'ien-Ming*, "Heaven-decreed," and in the following year declared war on China, then in possession of both Liaotung and Liaosi, defeated with immense slaughter an army of 200,000 sent against him, took Mukden in 1621, and on his capturing Liaoyang (which he made his capital) 70 cities surrendered to him. At his death in 1626 he was succeeded by his fourth son, who sent an army in 1627 into Korea (modern Chosen), which had been aiding the Chinese, conquered it and exacted tribute, and advanced into Liaosi and Mongolia. Meanwhile decay had seized the Ming dynasty then on the throne of China; formidable rebellions existed everywhere; one of the rebel leaders had captured Peking, and the Emperor stabbed himself and his daughter. Wu San-kwei, the general operating against the Manchus in Liaosi, at once patched up a peace with them and invoked their assistance in restoring order in China. The Manchus agreed with great alacrity, marched into China, recovered Peking, and kept it (1644), placing the grandson of Nurhachu on the throne with the reign title of Shun-chih (q.v.). China now came in contact with Russia, who by 1638 had reached the port of Okhotsk on the Pacific. As this place was situated too far north for a serviceable port, Russian encroachments began in the Manchurian region, with the purpose of securing control of the Amur River, then entirely within Chinese territory. Border conflicts between Manchu and Muscovite were ended in 1681 by the Treaty of Nerchinsk, a disastrous diplomatic defeat for Russia, as she was forced out of the Amur region and had to content herself with the Argun River and the Stanovoi Mountains as the boundary. A century and a half passed before Russia advanced again, this time with complete success. Taking advantage of China's complications with Great Britain and

France, Russia in 1860 by the Treaty of Peking acquired that part of Manchuria lying on the left bank of the Amur and east of the Usuri, extending to the Pacific and south to modern Chosen. This region is to-day known as the Primorsk, or Maritime Province, of Siberia. The cession of this important territory left the boundaries of Manchuria substantially as they existed in 1895.

In the Chino-Japanese War, 1894–95, Japan invaded Manchuria and captured Kaiping and Port Arthur. The Treaty of Shimonoseki, concluding the war, stipulated in part that Japan was to receive the Liaotung Peninsula, which includes Port Arthur, but Japan was forced to retrocede the peninsula to China through the collective intervention on China's behalf of Russia, France, and Germany. In return for this signal service, Russia in 1898 demanded and received of China a 25-year lease of Port Arthur and Talienwan (Dalny) and extensive railway and mining privileges throughout Manchuria. The Boxer Rebellion in 1900 furnished Russia the excuse to send military forces into Manchuria. These forces Russia promised to withdraw in three installments, which was not done, and Russian activities plainly pointed to the conversion of the temporary occupation of Manchuria into permanent possession. It was the fear of Russian absorption of Manchuria, and ultimately Korea, which drove Japan into the Russo-Japanese War of 1904–05. (See RUSSO-JAPANESE WAR for full treatment of the Manchurian situation at that time.) By the Treaty of Portsmouth, Sept. 5, 1905, Russia and Japan both agreed to evacuate Manchuria excepting Kwantung (the Liaotung Peninsula), where Japan succeeded to the lease and rights of Russia with China's consent, which was given Dec. 22, 1905. Russia also transferred to Japan that part of the Manchurian Railway which runs south from Changchun (Kuanchengtze) to Port Arthur. Since the war Russia and Japan have been very active in Manchuria, in the north and the south respectively. They have practically divided the three provinces into Russian and Japanese "spheres of influence." In 1909 Philander C. Knox, American Secretary of State, tried to prevent this by proposing the neutralization of the Manchurian railways, these to be bought by the Great Powers collectively and held by them until the expiration of the leases. His scheme met with no favor and only succeeded in drawing Russia and Japan closer together than ever. The result is apparent to-day, with Russia supreme in economic and strategic control of northern Manchuria and Japan likewise in the southern region. It is problematical what the situation will be in the future when the leases and railways are due to revert to the Chinese government and China is supposed to have regained full political and economic control.

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MANCHURIAN DEER. See SIKA.

MANCHURIAN SUBREGION. One of the zoögeographical subdivisions of the Palearctic region, which embraces China north of the Yang-tse, Manchuria, Korea, and Japan (q.v.). It has the fauna of the plains and seacoasts of eastern Asia. The mountains which separate it from the Siberian region permit many northern animals to stray far eastward along their lofty spurs; and the Manchurian fauna penetrates far westward along the intervening valleys and foothills. Its exclusive forms are few, and these are allied to Palearctic groups, and differ decidedly from the Oriental region to the southward. See DISTRIBUTION OF ANIMALS, and accompanying maps.

MANCHUS, măn′chōōz. A people whose representatives sat upon the throne of China from 1644 to 1912. They belong by language and physical type to the Tungusic group of Siberian (Mongolian) peoples, whose habitat includes a large portion of northeastern Asia between the Yenesei and the coast of the Pacific. The Manchus are rather tall, with mesocephalic head form. Up to the period of their conquest of China and their subsequent assumption to a large extent of Chinese culture, the Manchus seem to have been a rude, energetic, and warlike people, who adapted themselves to the tasks of empire with the skill and enthusiasm of a vigorous and healthy race of primitive habits and culture. Their original home seems to have been at the base of the Shan-a-lin, or Long White Mountains, north of Korea (modern Chosen). From this locality they gradually spread through conquest, at first as independent tribes and later united under the command of one chieftain, Nurhachu (born 1559). This leader carried on an incessant warfare against China, and reduced almost all of Manchuria, removing his capital from Mukden to Liaoyang. At his death in 1626 his fourth son succeeded him, exacted tribute from Korea in 1627, and advanced into Liaosi and Mongolia. In 1644 the Manchus were invited to Peking by the Chinese general Wu San-Kwei to assist him in crushing a rebellion. They captured Peking and remained there, establishing upon the Chinese throne the *Ta Ching* or "Great Pure" dynasty, which reigned from 1644 to 1912. The grandson of Nurhachu became the first Manchu Emperor of China, and took the name of Shun-chih (q.v.). From Shun-chih to Hsüan-t'ung, who abdicated in 1912, there were 10 Manchu emperors of China.

The Manchus followed a wise policy of conciliation in China, adjusting themselves to Chinese civilization, law, and culture. Especially did they encourage the Chinese system of education and the literati. With the exception of the first two emperors they were not well disposed towards intercourse with the rest of the world, and they strove to keep China as hermetically sealed as possible against new ideas from outside. The Manchus have never equaled the Chinese in scholarly or literary ability. They were at best a warlike race ruling China, and when their warlike nature was weakened their hold on the country became precarious. Long before the end in 1912 there were many rebellions against them, one of which, the Taiping (q.v.), from 1850 to 1864, came near ending Manchu rule at that time. As it was, their overlordship would have terminated much earlier than the recent revolution but for the Chinese respect for authority as formerly personified in the Emperor.

There are not many Manchus left to-day. In Peking they had largely intermingled with the Chinese, and in Manchuria they exist only in scattered communities. Provision is made in the new Chinese constitution for equal treatment of Manchus and Chinese in the Republic. The Manchu language is now practically dead. The alphabet consists of 25 letters (based on Mongol), six of which are vowels. They consist of certain marks and curves written on either side of a vertical stem, thus forming syllables, which are ranged in columns and read from left to right.

The Manchus introduced the queue into China, which to the Chinese, from a badge of servitude, became a mark of loyalty and veneration. The queue was abolished by the revolutionists in 1911. Foot binding was never practiced among Manchu women. From the Chinese the Manchus have received the form of Buddhism they profess, through which, however, the original Shamanism frequently crops out.

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MANCINELLI, män′chė-nĕl′lė, Luigi (1848–1921). An Italian composer and operatic conductor, born at Orvieto. He taught himself to play the piano and later studied the cello under Sbolci in Florence. In 1870 came the turning point in his career, with his engagement for the orchestra of the opera at Rome, under the famous Terziani. Within five years he had succeeded Terziani, and when the directorship of the Bologna Conservatory became vacant, in 1881, he was offered and accepted the position, and so revolutionized its methods that it rapidly rose to rank with the greatest music schools of Europe. His European fame as a conductor began at Drury Lane, London (1886–88), and was enhanced during his five years at Madrid in a similar capacity. At the conclusion of his service with the Madrid opera, he came to New York, where he was principal conductor at the Metropolitan Opera House from 1893 to 1902. Thereafter he directed in the principal opera houses of Italy, chiefly in Rome, and was an indefatigable and most influential worker for the art of Wagner. His compositions comprise: overture and entr'acte music to Cossa's *Cleopatra* and *Messalina;* the operas *Isora di Provenza* (1884), *Ero e Leandro* (1897), *Paolo e Francesca* (1907); the overtures *Isaia* (1887) and *Sant' Agnese* (1905). It is on his ability as a conductor that his fame chiefly rests.

MANCINI, mȧn-chē′nė. The name of five sisters, nieces of Cardinal Mazarin, who played a brilliant part at the French court during the early reign of Louis XIV. They were born in Rome and spent their childhood in that city, but between 1647 and 1653 were summoned to Paris by Mazarin, who undertook the charge of their education and advanced their fortunes at court. This "battalion of nieces," as Michelet calls them, comprised: (1) Laure (1636–57), a girl of amiable and pious disposition and the companion of the boy King Louis XIV. She became the wife of Louis de Vendôme, Duke de Mercœur, and died in childbed six years later. She was the mother of Louis, Duke de Vendôme, one of Louis XIV's greatest generals. (2) Marie (1639–c. 1715); she came to Paris in 1653, and after some time was attached to the court. (3) Olympe (1640–1708); she came to France in 1647, and her education was largely superintended by the Queen mother, Anne of Austria. She was witty and piquant and took a leading part in all the gayeties of the court. (4) Hortense (1646–99), the most beautiful and admired of the sisters. She came to France in 1653, and after a two years' education in a convent was introduced into the royal circle. (5) Marie Anne (1649–1714), the wit of the family, and for a time the soul of all courtly festivities. She married in 1662 Godefroy Maurice de la Tour, Duke of Bouillon, became the patroness of La Fontaine, and made her home a meeting place for celebrities like Corneille and Molière. Consult: Renée, *Les nièces de Mazarin* (Paris, 1856); Chatelauze, *Louis XIV et Marie Mancini* (ib., 1880); H. N. Williams, *Five Fair Sisters* (New York, 1906).

MANCINI, Pasquale Stanislao (1817–88). An Italian statesman and jurist, born at Castel Baronia, near Ariano, in Campania. He studied law at Naples, became professor of law at the university there when quite young, and in 1848 was deputy to the Neapolitan Parliament. On account of his liberal opinions he had to flee Naples, went to Turin in 1849, and was made professor of public law at the university. In 1860 he was elected to the Italian Parliament as a member of the Left. When the Italian Kingdom became a fact Mancini was made Minister in Rattazzi's cabinet. After 1872 he was professor of criminal law at Rome. From 1876 to 1878 he was Minister of Justice and Education under Depretis, and in this office procured the abolition of capital punishment, and showed himself an opponent of the Clerical party. From 1881 to 1885 he was Minister of Foreign Affairs, but had to resign on account of his colonial policy. Mancini was a brilliant orator and a zealous advocate of Italian unity.

MAN′CIPLE'S TALE, The. One of Chaucer's Canterbury Tales. It is the story of the white crow turned black by Apollo for telling of the falseness of his wife, Coronis. It is found in Ovid's *Metamorphoses*.

MANCO CCAPAC, män′kō kȧ-päk′. The founder of the Inca dynasty in Peru, and according to tradition the survivor of four brothers, children of the sun, who came forth from the apertures of the dawn, i.e., from the eastern cordilleras of the Andes. He established himself at Cuzco with his sister wife, Mama Oclla Huaco. He was supposed to have shown the people improvements in agriculture and architecture, and to have taught them the sciences and arts, by which means he acquired the leadership which was transmitted to his descendants.

MANCO IN'CA (?–1544). The last Peruvian ruler to oppose successfully the Spanish invasion of his country. He was the son of Huayna Ccapac (q.v.). Succeeding to the native headship after the murders of his brothers, Huascar and Atahualpa (1533), he tried to make friendly terms with the Spaniards, placing himself in their power. Pizarro treated him courteously and supervised his installation in accordance with the native rites. Manco, with a body of natives and Spanish auxiliaries, defeated the remnants of Atahualpa's armies, who were still maintaining the fight for independence against the Spaniards. Further acquaintance with his new friends changed his ideas, however, and in April, 1536, Manco left Cuzco and called upon his people to rally and drive out the Spaniards. A fierce attack was made on Cuzco, during which most of the city was burnt, but the followers of Pizarro successfully defended their position. After a siege of five months the Inca was compelled to retire, in order that his people might go home to sow their fields. He established himself at the stronghold of Ollantay-Tampu, in the Yucay valley. There Pizarro tried to capture him, but the attack was repulsed, and the natives followed the Spaniards back to Cuzco, which was again besieged. The arrival of Spanish reënforcements from Mexico and Panama and the return of Almagro from Chile compelled the Inca to withdraw to the wild mountainous country between the rivers Apurimac and Vilcamayu, where he maintained his independence with a small body of his relatives and followers. Here several renegade Spaniards sought refuge with him, and one of these killed the Inca during a sudden brawl, in 1544.

MANDÆ'ANS (from Mandaic *mandā*, knowledge), also called NASOREANS and, less correctly, ST. JOHN'S CHRISTIANS. A religious sect which has flourished in Babylonia very possibly since the beginning of the Christian era. At the present time the adherents of this faith live in the marshy lands near Basra and in Khuzistan. The number of Mandæans was estimated by Petermann in 1854 to be about 1500, but Siouffi in 1880 found about 4000. Thévenot in 1663 counted 3279 families. Ignatius a Jesu asserted that there were 20,000 to 25,000 families in 1652, but he may have included many heretical Christians. At the time of Mohammed they were probably a considerable body, forming the most important part of the Sabians or Baptists (from the Aramaic root *saba*, to baptize), to which the Elkesaites and Hemerobaptists also seem to have belonged. From them Mohammed may have adopted the custom of washings before the daily prayers. Hence he and his followers were long known as Sabians. As a people possessing a written revelation they were accorded by Mohammed the same privileges as Jews and Christians. The Mandæans have nothing in common with the pagans of Harran, who to gain for themselves these privileges falsely claimed to be Sabians and were thus permitted to continue their idolatrous practices. Whether the Mandæans designated themselves in any other way than as *Mȧndaye*, i.e., *gnostikoi* (those who have the knowledge), is not certain. Their religious views are known through their extant writings. Among these the most important are *Ginza* (The Treasure), also called *Sidra rabba* (The Great Book); *Sidra de Yahya* (The Book of John), also called *Derashe de malke* (Discourses of the Angels); and *Ḳolasta* (Purity), a collection of baptismal songs; there are also *Diwan* (The Book), *Asfar Malwasha* (Signs of the Zodiac), and a number of incantations, some of them discovered at Nippur. *Ginza* was published by Norberg from a Paris codex dated 1633, and more critically by Petermann from another Paris codex dated 1560. *Ḳolasta* was published by Euting from several manuscripts, the oldest of which was written in 1570. *Sidra de Yahya*, *Diwan*, and *Asfar Malwasha* exist only in late manuscripts. A large collection of incantations, all of recent date, have been published by Pognon. All of these writings are of composite authorship; they represent a long development, and the Mandæan religion is a mixture of many elements. The earliest parts of *Ginza* apparently present a purely pagan gnosticism, as yet uninfluenced by Jewish or Christian thought. Lagarde has pointed out that some of the sections showing familiarity with Judaism go back to a period when animal sacrifices were still practiced and the Christians were regarded as merely a Jewish sect, consequently to the first century A.D. Nöldeke has indicated some parts that must have been composed in the Sassanid period (226–651). But even *Ginza* and *Ḳolasta* contain many elements that are evidently later than Mohammed. It is probable that certain elements were at first borrowed from Christianity. Much old Babylonian and Persian speculation has also survived in Mandæanism. According to the original polytheistic doctrine, the soul belongs to a better world, the realm of the "first life," and is only temporarily attached to the body in the world of matter, in which the gods of light have chained the powers of darkness. This world is the creation of the powers of the "second life," who try to drag men down from the world of light. Through *Manda de Hayye*, the personified "knowledge of life," the soul may be brought back to its pristine state. An important symbol and means of purification is the holy lustration. The relations between these Baptists on the Euphrates and John the Baptist have not yet been cleared up. He maintains a position of honor among them, and this led to the name Christians of St. John, given by missionaries of the seventeenth century. Notwithstanding the Christian elements in their faith, they are bitterly hostile to certain Christian doctrines as well as to the Jews. They declare that *Jeshu Meschicha* (Jesus the Messiah) and his mother, *Rucha Ḳudscha* (the Holy Ghost), are evil spirits and the authors of all false religion. Efforts on the part of Nestorian missionaries to convert them may have caused this hostility. They have bishops, priests, and deacons, and admit women to these offices. They have a sort of Lord's Supper and observe Sunday and fasts. They are polygamous and command the marriage of priests.

The Mandaic language belongs to the Aramaic branch of the Semitic family. It is only dialectically different from the language of the Babylonian Talmud, and probably represents the Aramaic speech of Babylonia from Upi to the Persian Gulf. Its syntax is particularly important. Even its vocabulary shows less foreign influence than the kindred Aramaic tongues. A grammar has been written by Nöldeke. The script is a form of the Syriac, closely akin to that which was carried to Manchuria and Mongolia by Mesopotamian missionaries. It seems to have been in use in the seventh and eighth centuries. The Mandæans now use the Arabic language. *Ginza* was translated into Latin by Norberg. Tychsen and De Sacy translated some sections of *Kolasta* and *Sidra de Yahya*. Large parts of *Ginza* have been rendered into German by Brandt. Some of the incantations have been translated by Pognon. The religion has been best described by Brandt.

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MANDALAY, măn′dȧ-lā. The capital of a district and division of Upper Burma, India, on the left bank of the Irrawaddy, 350 miles north of Rangoon, with which it has railway, river, and telegraphic communications, and 17 miles above Amarapura, which it replaced in 1857 as the capital of the former Kingdom of Burma (Map: Burma, C 2). Since the British occupation in 1885 the town has been greatly improved, a disastrous fire in 1892, which destroyed nearly the whole of the city, facilitating the necessary measures. It covers an area of 6 square miles and is traversed by fine, shady, and well-lighted thoroughfares. It consists of the walled town, now called Fort Dufferin and used as the cantonment, inclosing the palace, the former residence of King Theebaw, the government house, and the hall of justice, and the extramural town with its numerous temples, pagodas, and monasteries, and the Zagyo bazar noted for its wares and the heterogeneous and polyglot character of its habitués. Perhaps the most remarkable feature of the town is the Kuthodaw, or 450 Pagodas, consisting of the Buddhist scriptures engraved on 450 stones inclosed in as many pagodas ranged around a square of about half a mile in extent. Silk weaving is the chief industry. Pop., 1891, 188,815; 1901, 183,816; 1911, 138,299.

MANDA′MUS (Lat., we command). An extraordinary legal remedy afforded by a writ or command of a court of competent jurisdiction issued in the name of the state, directed to an inferior court, an officer, corporation, or individual, requiring it or him to perform a public duty as required by law. The writ of mandamus was originally a command of the sovereign and was without judicial character, hence it is that it is called a prerogative writ. As a purely prerogative writ its issuance was wholly a matter of discretion with the sovereign, and with its assumption of a judicial character it remains to some extent prerogative in the sense that it is granted at the discretion of the court. By discretion, however, is meant sound legal discretion; and the writ is now regarded as a remedy to be granted in a proper case according to well-settled legal principles. The writ is a purely legal and not an equitable remedy, although, in commanding things to be done, the court acts *in personam*, an exception to the usual practice of courts of law. See EQUITY.

The writ of mandamus will be issued only when the petitioner is without adequate remedy by an action at law, and then only to compel the performance of an official public duty which the officer, after demand, has refused or failed to perform. The duty must also be clear and undoubted, and it must be purely ministerial and not judicial or discretionary in character, for the court will not substitute its discretion for that of the officer the validity or propriety of whose act is in question.

The procedure upon the application for the writ and its issuance is now almost wholly regulated by statute. Consult: H. G. Wood, *Treatise on the Legal Remedies of Mandamus and Prohibition* (3d ed., Albany, 1896); T. C. Spelling, *Treatise on Injunctions and Other Extraordinary Remedies* (2d ed., Boston, 1901); W. F. Bailey, *Treatise on the Law of Habeas Corpus and Special Remedies* (2 vols., Chicago, 1913).

MAN′DAN. A city and the county seat of Morton Co., N. Dak., 5 miles northwest of Bismarck, on the west bank of the Missouri River and on the Northern Pacific Railroad (Map: North Dakota, D 4). It is in a lignite coal-mining region, has deposits of clay, and carries on a trade in live stock, wool, dairy products, and grain. There are railroad machine shops here, the city being a division point on the Northern Pacific. Mandan has the State Reform School and a government experimental station. In the vicinity are prehistoric mounds of considerable interest. The city adopted the commission form of government in 1907. The water works are under municipal ownership. Pop., 1890, 1328; 1900, 1658; 1910, 3873.

MANDAN. A noted and interesting tribe of Siouan stock (q.v.), now settled on Fort Berthold Reservation, at the junction of the Little Missouri with the Missouri River, North Dakota, in alliance with the Arikara (Ree) and Minitari (Hidatsa or Gros Ventres, q.v.). They formerly lived much farther down the Missouri and were then a numerous and influential people, but their decline has been almost without parallel for its rapidity. About 1773 they occupied nine villages on both sides of the Missouri about the entrance of Heart River. Pressed by the Sioux and wasted by smallpox, they soon afterward moved up the river, combining now into six villages. By 1804 they had again removed up the river, reduced now to two villages, and settled a few miles below the entrance of Knife River, in close neighborhood to their friends, the Arikara and Minitari (q.v.). Here they were found by the explorers Lewis and Clark, who wintered among them and have much to say of their friendly character. Here it was also that they were nearly exterminated in 1837 by the smallpox, which, brought first to their villages by a trading steamer, rapidly swept the whole plains, destroying thousands of victims and spreading death and terror among all the tribes from Canada to the Gulf. The Mandan were reduced in a few weeks from a tribe of about 1600 to a mere handful, reported, on what seems good authority, at 145 souls. Whatever may have been the true number, it was so small that they were lost sight of. The Arikara, who had lost about half their own number, moved into the untenanted Mandan villages, and for some years the Mandan tribe was thought by the traders to have become extinct. A few were still left, however, among the Arikara and Minitari, and with rare determination they set about building up again their shattered tribal structure. Within 10 years they were again a tribe, small but respected. In 1845 the Minitari moved up the river to the present location at Fort Berthold, where the Mandan soon afterward joined them, to be followed still later by the Arikara. They now number 209.

In spite of their migrations, the Mandan were not properly a nomadic people, but lived in stockaded villages of large and substantial circular log houses with earth-covered roofs, similar to those of the Pawnee and other sedentary tribes along the Missouri River. (See EARTH LODGE.) They were agricultural, raising corn, tobacco, and sunflowers, besides going out upon the plains to hunt buffalo at regular seasons. They tattooed upon the face and breast, and were usually designed as "tattooed people" in the sign language. They used a peculiar circular boat, known as a bull boat and much resembling a tub in shape, made of buffalo skins stretched over a willow frame. Among all the tribes they were noted for their elaborate ceremonials and particularly for the terrible self-imposed tortures of the great Okeepa rite, described by Catlin. The light complexion and hair frequently seen among them, the principal ground on which Catlin and others have tried to establish a theory of Welsh origin, are due partly to a species of albinism by no means rare in some tribes, but more to admixture of white blood. Consult: R. G. Thwaites, *Early Western Travels*, vols. xxii–xxiv (Cleveland, 1905); Will and Spinden, "The Mandans: A Study of their Culture, Archæology, and Language," in *Peabody Museum of American Archæology and Ethnology, Papers*, vol. iii (Cambridge, Mass., 1908); R. H. Lowie, *Societies of the Mandan and Hidatsa Indians* (New York, 1913); George Catlin, *North American Indians* (2 vols., Philadelphia, 1914).

MANDARA, mȧn-dä'rȧ, or **WANDALA**, wȧn-dä'lȧ. A small negro kingdom in central Sudan, Africa, south of Lake Chad and tributary to Bornu (q.v.). It is a wild and densely forested mountain region. Its population numbers about 250,000 and consists of negroes professing Islam and advanced industrially to some extent. The chief town, Doloo, is fortified. Since 1893 Mandara has belonged partly to the German and partly to the British sphere of influence.

MAN'DARIN (Portug. *mandarim*, from Malay, Hind. *mantri*, councilor, from Skt. *mantrin*, councilor, from *mantra*, council, from *man*, to think). Any Chinese official, civil or military, who is entitled to wear a button on his official hat. The term is entirely unknown to the Chinese, who speak of them officially as kwan. There are nine ranks, each distinguished by a different-colored ball or button placed on the apex of the cap or hat, by a peculiar emblazonry on the breast (a bird in the case of a civil officer, and a wild beast in the case of military men), and a different clasp on the girdle. A mandarin is not allowed to hold office in his native province; he is not allowed to marry in the jurisdiction under his control, nor own land in it, nor have a near relative holding office under him; and he is seldom continued in office in a station or province for more than three years. It is incumbent on every provincial officer to report on the character and qualifications of all under him. The Mandarin dialect was properly the language of the court. During the late Manchu dynasty it was Pekingese; in some preceding dynasties it was the dialect spoken at Nanking. With slight variations mandarin, or Kwan Hwa, is spoken over three-fourths of the country, as well as in Manchuria.

MANDARIN. See Colored Plate of CITRUS FRUITS.

MANDARIN DUCK. The mandarin duck (*Aix galericulata*) is one of the most exquisitely colored of birds. It is a comparatively small species, about the size of a teal, and is very closely related to the common wood duck (*Aix sponsa*) of the United States. A native of China, it has been introduced as a semidomesticated bird, for ornament, into Europe and the United States. It is beautifully variegated with green, chestnut, purple, and white, and fine black markings. In addition to the gorgeous coloration, certain peculiarities of plumage on the head, neck, and wings add greatly to the beauty. The mandarin duck is said to be remarkable for being monogamous, and for remaining paired throughout life; it is an object of veneration to the Chinese, as an example of conjugal fidelity.

MAN'DATE (from Lat. *mandatum*, command, from *mandare*, to command, from *manus*, hand + *dare*, to give). 1. In the civil law, an undertaking by virtue of which one becomes the gratuitous agent of another. The term is derived from the Roman law, under which the mandate was the first form of agency recognized.

2. At common law the term "mandate" is sometimes employed to designate bailment made for the sole benefit of the bailor. See BAILMENT. Consult the authorities referred to under the titles AGENT; BAILMENT.

3. In the law of procedure the term "mandate" is sometimes loosely applied to any judicial command.

MANDAUE, mȧn-dou'ȧ. A town of Cebú, Philippines. It is situated on the east coast near the north entrance to Cebú Channel, 4 miles northeast of the town of Cebú. The chief industry is rice culture. Pop., 1903, 11,078.

MANDAYA, mȧn-dä'yȧ. A wild Malay tribe in southeastern Mindanao. The Mandaya inhabit the greater part of the Pacific coast of Mindanao, the headwaters of the Agusan River, and most of the district between Davao Gulf and Butuan Province. In the latter districts they are known as Mansaka, Mangwanga, Managosan, and Pagsupan. The tribe as a whole has no ruler, but is divided up into small groups, each with its own chief or *bagani*. He is its supreme ruler, but has no power over other groups. To become a *bagani* it is necessary for a man to have killed a certain number of persons. Fights are frequent and are precipitated by an aspirant for *bagani* honors, or are caused because of a desire for slaves or revenge. The weapons used are shields, spears, knives, and daggers. This latter is the traditional weapon of the Mandaya, who never ungirds it unless he be in the company of only near relatives. In some regions bows and arrows are found, but they are not in common use.

Except in districts influenced by the white man these people build their houses high in the branches of trees, where they are safe from sudden attacks of enemies. The houses are generally surrounded by clearings in which a variety of vegetables are raised. However, these crops are usually so small that even with the addition of game and forest products there is a yearly period closely bordering on starvation. Consult F. C. Cole, "Wild Tribes of Davao District, Mindanao," in *Field Museum Publication 170* (Chicago, 1913). See PHILIPPINE ISLANDS.

MANDEL, män′del, EDUARD (1810–82). A distinguished German engraver, born in Berlin, where he studied at the Academy under Maré and Buchhorn. The success of his first important plate, after Hildebrandt's "The Warrior and his Child" (1835), brought him the commission from the Prussian Art Union to engrave "Lorelei" after Begas, and in 1837 his election to the Academy. He completed his studies in Paris (1839–40) under Henriquel-Dupont, and in 1842 was appointed professor at the school of engraving connected with the Berlin Academy, of which he became director in 1856. He was one of the chief masters of modern engraving in Germany, unexcelled as regards correct drawing, fine feeling for rendering color, and plastic vigor. His most admired plates include: "Van Dyck's Portrait of Himself" (1841); "Titian's Portrait of Himself" (1843); Van Dyck's "Charles I" (1850); "Frederick the Great"; Raphael's "Madonna Colonna" (1855) and "Madonna della Sedia" (1865); "La Bella di Tiziano" (1868); but above all Raphael's "Madonna di San Sisto," the crowning effort of his life, completed shortly before his death and superior to the best previous reproductions of that master's work. Consult Pietsch, *Eduard Mandel und seine Werke* (Berlin, 1883).

MANDELGREN, män′del-grān, NILS MÅNSSON (1813–99). A Swedish artist and critic, born at Ingelsträde (Skåne). He was a student at Stockholm, Copenhagen, Paris, and Rome, and afterward obtained a pension from the government for his archæological services (1873). In 1851 he went to Paris and there wrote his *Monuments scandinaves du moyen-âge* (1855–62). He did much to encourage industrial art in Sweden and assisted in the foundation of the Swedish Society of Industrial Arts (1844). His other writings include *Samlingar till svenska konst- och odlinghshistorien* (1866) and *Atlas till Sveriges odlingshistoria*, a large work to contain 1200 plates with text, of which four parts appeared in 1877–84. For its continuation he willed money and his collections to the University of Lund.

MANDELKERN, män′del-kĕr′n, SOLOMON (1846–1902). A Russian Hebraist. He was born near Dubno, Volhynia, studied at the rabbinical schools of Vilna and Zhitomir, and took courses in Oriental languages at St. Petersburg and jurisprudence at Odessa, after which he received the degree of Ph.D. from the University of Jena. For seven years (1873–80) he was assistant rabbi at Odessa, and thereafter, except for a visit to the United States in 1900, lived at Leipzig. His literary work began in 1866 with a biblical poem ("Bat Sheba") which attracted considerable attention. After that he wrote many historical articles, satires, and epigrams for the Hebrew periodical *Ha-Shahar*. A collection of these, entitled *Hizzim Shenunim*, appeared in Vilna in 1875. His Zionist poems, *Shire Sefat Eber* (2 vols.), beautiful expressions of enlightened patriotism, were published in Leipzig in 1882 and 1889. His history of Russia, *Dibre Yeme Russia* (1876), enjoyed greater popularity than it merited. But his Hebrew-Latin Biblical Concordance (1896), which was 20 years in preparation, is a most scholarly work; indeed it is still the best of its kind. His other works include a Russian-German dictionary, a history of Russian literature, and numerous translations.

MANDELSTAMM, män′del-shtäm, LEON (1809–89). A Russian Hebraist and educator, born in the Province of Kovno and educated at the universities of Moscow and St. Petersburg. He traveled much and gained an intimate knowledge of European languages. In 1846 he became secretary of a rabbinical commission at St. Petersburg appointed to consider ways and means of educating the Jews in Russia. In this capacity he edited and published numerous textbooks suitable for Jewish schools, superintended a large body of teachers, and directed the opening of new schools. On leaving the government service in 1857 he went abroad and settled in Berlin, where most of his writings were published. These include: *Biblische Studien* (2 vols., 1862); *The Rascals of Saratov* (1863), an exposé of the scandalous ritual murder trial of 1857; *The Jewish Family* (1864), a dramatic novel in verse; *Stimmen in der Wüste* (1880). Mention should also be made of his Hebrew-Russian and Russian-Hebrew dictionaries (2 vols., 1859–60) and of his Russian translation of the Bible (1869). After a very brilliant career Mandelstamm spent the last years of his life in poverty and oblivion. His library forms the nucleus of the Jewish section of the New York Public Library.

MANDER, män′dĕr, KARL VAN (1548–1606). A Flemish painter and author. He was born in Meulebeke, near Courtrai, of a noble family, and received an excellent education. He studied art and poetry under Lucas de Heere in Ghent, and painting with Vlerick in Courtrai, and spent three or four years (1573–77) in Italy, mainly at Rome, working with Spranger. At Amsterdam he established with Goltzius an art school, of which Franz Hals was the most famous pupil, and he became head of a circle of poets. His literary activity almost entirely overshadowed his paintings, which are scarce, artificial, and of no great excellence. Among them are a "Deluge," at Schleissheim; "Portrait of a Man," in Vienna; and possibly "Juda and Tamar," in Brunswick. His original poetry was printed in 1597 under the title *De gulden harp*. He translated Vergil's *Bucolics* and *Georgics* (1597), and 12 books of the *Iliad* from the French (1611). But his most important work was *Het schilderboek* (The Book of Painters) (1604), a biographical dictionary of early Netherlandish and German painters. Although filled with unreliable anecdotes and lacking in sound criticism, it is nevertheless, in the absence of more reliable accounts, an invaluable source of information for Flemish and Dutch painting of the sixteenth century. New editions were printed at Amsterdam in 1617 and 1764; a French version at Paris in 1884. The best and most complete edition, with German translation and comments, is by Floerke (2 vols., Munich, 1906). Consult the work just cited and Plettinck, *Studien over Karel van Mander* (Ghent; 2d ed., 1887).

MAN′DERSON, Charles Frederick (1837–1911). An American soldier and politician, born in Philadelphia. He removed in 1856 to Canton, Ohio, where, in 1859, he was admitted to the bar, and at the outbreak of the Civil War enlisted in the Federal army. He rose to the rank of brigadier general of volunteers, resigning in April, 1865, because of wounds. He was twice elected prosecuting attorney of Stark County. In 1869 he removed to Omaha, Neb., and was for six years city attorney, and was a member of the Constitutional Convention in 1871 and again in 1874. He served as a Republican in the United States Senate from 1883 to 1895, and was President pro tempore of the Senate for the Fifty-first and the Fifty-second Congresses (1891–95). Afterward until his death he was general solicitor for the Burlington Railroad System west of the Missouri River. In 1899 he was elected president of the American Bar Association.

MANDEVILLE, măn′de-vĭl, Bernard (?1670–1733). Author of the *Fable of the Bees*, born in Dort (or Dordrecht), Holland, about 1670. In a thesis maintained at Leyden, March 23, 1689, and entitled "De Brutorum Operationibus," he argued that brutes act automatically—a theory of Descartes and of the older theology. Having taken his degree in medicine at Leyden, he settled in London as a physician. Never gaining much practice, he received, it is said, a pension from Dutch merchants, and turned a more or less honest penny by advocating dram drinking, to the advantage of distillers, who recognized his services by *douceurs*. He died in London, Jan. 21, 1733. His famous book, a doggerel pamphlet, first appeared under the title *The Grumbling Hives, or Knaves Turned Honest* (1705). It was republished in 1714, with the title *The Fable of the Bees, or Private Vices Public Benefits.* A second edition with additions (1723) was presented as a nuisance by the grand jury of Middlesex. A second part appeared in 1728. Mandeville attempted to prove, perhaps with irony, that "private vices are public benefits"; that waste, luxury, and profligacy are good things for a state. His audacious thesis led to a sharp controversy, in which Bishop Berkeley took a hand (*Alciphron*, 1732). Among Mandeville's other works are: *Esop Dressed, or a Collection of Fables Writ in Familiar Verse* (1704); *Free Thoughts on Religion* (1720); *An Enquiry into the Causes of the Frequent Executions at Tyburn* (1725). Consult P. Sakmann, *Bernard de Mandeville und die Bienenfabel-Controversie* (Freiburg, 1897), and J. M. Robertson, *Pioneer Humanists* (London, 1907).

MANDEVILLE, The Travels of Sir John. The title of a famous itinerary and collection of marvels, composed in the third quarter of the fourteenth century. The book opens and closes with delightful fragments of an apocryphal autobiography. The author claims to be one John Mandeville, born at St. Albans, who crossed the sea in 1322 and traveled through Tartary, Persia, Armenia, Africa, Chaldæa, Ethiopia, Amazonia, and India. On his return he stopped at Rome, where his "book was proved for true" by the Pope's council. He adds that he first wrote it in Latin and then turned it into French and English (1356). Until very recently all these statements were accepted as facts. It now seems clear that of the versions named the French (1371) is the oldest, and that from it were derived the others (early part of fifteenth century). Though the writer of the French original may have traveled in the East, his work is mainly a compilation from the travels of a German knight, William of Boldensele (1336), the journal of Friar Odoric (1330), the journey of Johannes de Plano Carpini, a papal envoy to the Tatars (about 1250), the history of the East by Hetoum, the Armenian (1307), other itineraries, and the mediæval *specula*. He drew upon Pliny, Solinus, Peter Comestor, Vincent of Beauvais, Brunell-Latine, and Jacques de Vitry. With little doubt the compiler of the work was Jean de Bourgogne dit à la Barbe (John of Burgoyne with the Beard), who died at Liége in 1372. He may have been the John of Burgoyne who likely quitted England in 1322 and had good reasons for living under an assumed name. The *Travels of Sir John Mandeville*, abounding in marvels, has delighted many generations. Of the work there are three English versions extant in at least 34 manuscripts. From the poorest were printed the 15 editions from 1499 to 1725. A better version, edited anonymously in 1725, was carelessly reprinted by Halliwell (London, 1839–68), and edited, with modern spelling, by Wright, in *Early Travels in Palestine* (ib., 1848); by Morley (ib., 1886); and, with three illustrative narratives, by Pollard (ib., 1900). A third version (northern dialect) was edited by G. F. Warner for the Roxburghe Club (Edinburgh, 1889). For a detailed study of the sources, however, the reader is referred to Albert Bovenschen's *Die Quellen . . . des . . . Mandeville* (Berlin, 1888).

MANDINGO, măn-dĭn̠′gō̍ (native name, *Mande-nga*). An extensive linguistic group of negroes more or less mixed with Hamites, dwelling in western Africa from the Senegal and Upper Niger to Monrovia, and numbering many millions. Physically they are spare and athletic; height, 1.700 millimeters, or 67 inches; the cranial index or proportion of head width to head length is 75.5–78.8. They frequently have aquiline noses and features distinct from the negro, though the hair is woolly. In their food, dress, and habitations they are far above savagery, and, under Arab teachers, have attained a certain degree of culture. The speech, called Mandi, is widespread and divided into many dialects, encircling Timbuktu and encroaching on Fulah and Hausa. About 700 years ago the Empire of Mali was founded by the ancestors of this people in the Upper Niger region, and under King Musa (1311–31) it covered the Gambia and Joliba basins. The Upper Niger tribes still call themselves Mali'-nke. In religion they are Mohammedan, having embraced that faith centuries ago and propagated it with great vigor. The Mandingos were divided into numberless tribes, each speaking its own dialect, and, through their lack of cohesion, they were conquered about 1500 by the Sonrhay. The English planted factories among them in 1618, but the expeditions into the Niger country ended in disaster. The French in the next century cut off the progress of the English. In 1862 the Gambia Mandingos waged a propaganda for Islam in which hundreds of settlements of pagan tribes on the Gambia were laid waste. Consult Sir H. H. Johnston, *Liberia, with an Appendix on the Flora by Otto Stapf* (2 vols., London, 1906), and Migeod, *The Languages of West Africa* (2 vols., ib., 1911–13).

MAN′DIOC. A starch-producing euphorbiaceous plant. See CASSAVA.

MAN′DOLIN (Fr. *mandoline*, from It. *mandolina*, dim. of *mandola*, *mandora*, variants of *pandora*, sort of lute, from Gk. *πανδοῦρα*, *pandoura*, Ossetic *fändur*, Armen. *pȧndiṙ*, stringed instrument, of Lydian origin). A musical instrument of the lute species. The body of the mandolin is shaped like a shell, formed of a number of narrow pieces of different kinds of wood, bent into the shape, and glued together. On the open portion of the body is fixed the sounding board, with a finger board and neck like a guitar. The Neapolitan mandolin, which is the most perfect, has four double strings, which are tuned, beginning with the lowest, g, d^1, a^1, e^2. The Milanese mandolin has six strings, tuned g, b, e^1, a^1, d^2, e^2. In Spain the mandolin is built with six double strings tuned g♯, c^1♯ f^1♯, b^1, e^2, a^2. There is also a Turkish mandolin, which has seven double strings. The kind of mandolin most generally used to-day is the Neapolitan. Its range is g–e^3. The strings are struck by a plectrum held in the right hand, while the fingers of the left hand regulate the notes as on the violin. As the instrument cannot sustain long notes, it is customary to play all such as a tremolo, just as is sometimes done on the piano by the rapid change of fingers on the same note. Although the mandolin has never been an orchestral instrument, operatic composers have occasionally employed it to obtain characteristic effects.

MAN′DRAKE (ME. *mandrake*, *mondrake*, *mandrag*, *mandrage*, *mandragora*, from Lat. *mandragoras*, from Gk. *μανδραγόρας*, *mandragoras*; influenced by popular etymology with *man* + *drake*, dragon, in allusion to the shape of the root and its supposed aphrodisiac qualities), *Mandragora*. A genus of plants of the family Solanaceæ. Two species are described by some botanists, the autumnal mandrake (*Mandragora autumnalis*), which flowers in autumn and has lanceolate leaves and ovate berries; and the vernal mandrake (*Mandragora officinarum*), which flowers in spring and has oblong-ovate leaves and globose berries. Both are natives of the south of Europe and of the East. The root, which often crudely resembles the human figure, is large and carrot-like, and from it the leaves spring with no apparent stem, and among them the stalked whitish flowers. The plant has a fetid, narcotic smell and is reputed poisonous. From ancient times aphrodisiac virtues have been ascribed to the mandrake, which was therefore supposed to cure barrenness. (See Gen. xxx. 14–16.) In the United States the name mandrake is often applied to the May apple (*Podophyllum peltatum*), a low-growing perennial plant, the fruiting stem of which divides about a foot from the ground, each branch bearing a large peltate leaf between which is a white flower succeeded by the yellow, fleshy fruit, about the size of a plum. Single flowerless stems bear peltate, seven to nine lobed leaves. The dried rootstock is used in medicine. It has alterative, cathartic, and emetic properties.

MANDRAKE (*Mandragora officinarum*).

MANDRIL, or **MAN′DREL** (from Fr. *mandrin*, mandril, from Lat. *mandra*, Gk. *μάνδρα*, stall, bed for insertion of the stone of a ring). A bar of metal very slightly conical or tapering inserted in a hole in the centre of a piece of work to hold it during the process of turning, as in a lathe, or to enable work to be done upon the outer surfaces of an article while it is held or kept from deformation. Mandrils are much used in forging, sheet-metal working, spinning, and similar processes.

MAN′DRILL. A baboon (*Cynocephalus mormon*, or *Papio sphinx*), the largest of the tribe, and perhaps the ugliest in features and disposition. It is nearly related to the drill, and its characteristics are fully described under BABOON. This animal inhabits west Africa, ranging from Senegambia to the Congo. Although it was known to the ancients, we are ignorant of most of its life history. It goes in bands, and the adults with canine teeth 1½ inches in length are very dangerous, especially to unarmed travelers. They are omnivorous, insects and fruit forming the chief articles of their diet. The mandrill can be tamed when taken young and a few which have been kept in European zoölogical gardens have shown under training much intelligence, but few pleasant traits. See Plate of BABOONS.

MANDURIA, mȧn-dōō′rē̇-ȧ. An ancient town in the Province of Lecce, south Italy, situated about 27 miles west of Lecce (Map: Italy, F 4). It has remains of ancient walls and produces olives, wine, grain, and fruit. The place is of Greek origin. Pop. (including Uggiano Montefusco), 1901, 13,113; 1911, 14,031.

MANDVI, mänd′vē′. A seaport of the native State of Cutch, Bombay, India, on the northern shore of the Gulf of Cutch, 180 miles southeast of Karachi (Map: India, A 4). Though there is no regular landing place, boats of any size can land at the sandy beach, and large vessels find secure anchorage in the offing. Mandvi has direct steamship communication with Bombay and is the outlet for a large area. Pop., 1891, 38,155; 1901, 24,683; 1911, 24,235.

MAN-EATER SHARK. A shark which is known or believed to devour men; specifically, the great "white" or "blue" shark (*Carcharodon carcharias*, or *rondeleti*) of the family Lamnidæ. This is one of the largest of the sharks, reaching a length of 30 or 40 feet. It frequents all temperate and tropical seas, and is occasionally taken on both the Atlantic and Pacific coasts of the United States. Its body is stout, and the caudal fin large and strong, giving great swimming power; the nose is square and pointed, the eyes prominent, the mouth very large and armed in both jaws with five rows of triangular teeth, which are peculiar in being serrated. In a specimen 36½ feet long, it is recorded, the teeth measured 1¾ inches across the base. There have frequently been dredged in the central Pacific *Carcharodon* teeth 4 inches across the base, indicating sharks more than twice as large; and it is believed that the owners of these teeth were living within a comparatively recent period. The color of the skin is by no means white, but of the hue of lead, with the tips of the pectoral fins black. This monster ranges the seas, seizing and devouring whatever it is able to overcome; a specimen taken in California had a young sea lion weighing 100 pounds in its paunch. Like other sharks, they follow ships for many days, feeding upon the offal thrown overboard and upon other fishes attracted by the same bait. That the larger ones might easily bite off the leg or devour the whole body of a man is not to be doubted; and unquestionably many such casualties have occurred to persons in tropical seas, although experienced swimmers, such as the pearl divers, profess to fear them little, being able to frighten them away, or avoid their rush, and even to stab them to death with a knife.

The earliest remains of this genus of sharks have been found in the Upper Cretaceous beds of Texas. In the Eocene marls of the Atlantic and Gulf coasts, especially in New Jersey and North Carolina, the teeth of *Carcharodon* are quite abundant and form an important source of the phosphate on account of which the deposits are mined. These fossil teeth often attain a size of 6 inches in width at the base and 6½ inches in height. This implies an owner fully 100 feet in length. Contemporary with this predecessor of the present species was another, distinguished by having a little projection on each side of each tooth near its base, and this species attained a length of 50 or 60 feet, and must have aided its larger relative in clearing the Miocene ocean of *Zeuglodon* and other great marine reptiles. They swarmed, as is known from the frequency of their teeth in the Tertiary deposits of many parts of the world, and seem to have been especially numerous along the southeastern coast of North America. The teeth of these, as well as of modern sharks, also abound on the floor of the deeper parts of the present oceans. See Plate of Sharks.

MANED WOLF, or Red Wolf. An extraordinary wolflike animal (*Canis jubatus*), regarded as the only true wolf in South America, and held by some naturalists to be entitled to generic distinction. It inhabits Brazil, Paraguay, and northern Argentina, but does not extend south of the borders of the pampas. It is about the size of the common wolf, but not so heavy, its height being due to its long, ungainly legs, which give it a peculiar stilted appearance. (See Plate of Wolves and Wild Dogs.) It has a rather slender, pointed head, long ears, and comparatively short tail. The general color is bright yellowish red, with a black patch on the nape of the neck, another on the lower jaw, and one on each foot, forming conspicuous black "stockings." This aspect and its habits seem to remove it from the company of the true wolves and place it nearer the fox dogs. (See Fox Dog.) It never assembles in packs, but lives in the forest in pairs and hunts entirely alone. It is nocturnal, secretive, timid, and rarely seen, and is feared by nobody. It will sometimes attack deer or sheep, but lives mainly upon small rodents. It also catches birds, reptiles, insects, and even eats fruits. An interesting account of this animal in captivity, accompanied by portraits, was written by Joseph Gleeson, in the *Century Magazine* for September, 1902.

MANÉN, mȧ-nān′, Juan (1883–). A Spanish violinist and composer, born at Barcelona. His progress in music was so rapid that his father exhibited him as a piano prodigy. Having studied the violin under D. Alard, he suddenly appeared as a violinist, and met with such success that in Germany he was compared to his famous countryman Sarasate (q.v.). Likewise he attracted much attention as a composer, not only in Spain, but perhaps to even a greater degree in Germany, where he resided at different times for protracted periods. His works comprise: the operas *Giovanna di Napoli* (1903), *Acté* (1903), *Der Fackeltanz* (1909); the symphonic poem *Nueva Catalonia;* a violin concerto; a suite for violin and piano; and a number of exquisite miniatures for violin and orchestra.

MANES, mā′nēz (Lat. nom. pl., OLat., *manis*, *manus*, good, in full, *Di Manes*, the good gods, deities whom the living have no need to fear so long as they appease them with proper offerings. Perhaps, however, the designation is euphemistic, like Eumenides, q.v.). A somewhat indefinite appellation given by the Romans to the powers of the lower world. In the earlier religious conception the term seems to be used without special reference to the souls of the departed and to denote rather the deities concerned with the realm of the dead. They are, therefore, invoked in all ceremonies which concern the dead, and on such occasions as the "devotion" of P. Decius Mus to the gods of the lower world, or in curses. Later, as early as the time of the Twelve Tables (q.v.), the dead were thought of as deified; we now find the Manes conceived of as deified souls like the earlier *Di parentum*, and on monuments the letters D. M. (*Dis Manibus*) apparently dedicate the spot to them. To the Manes offerings were made at funerals, and at such commemorative ceremonies as the *Parentalia*, held by the Romans in February in honor of their dead ancestors. These offerings included libations of wine, warm milk, oil, honey, and the blood of black victims (pig, sheep, bull—the *Suovetaurilia*). Consult: W. H. Roscher, *Ausführliches Lexikon der griechischen und römischen Mythologie*, vol. ii, part ii (Leipzig, 1894–97); W. W. Fowler, *Roman Festivals* (London, 1899); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

MANES. The founder of Manichæism. See Mani; Manichæism.

MANET, mȧ′nȧ′, Edouard (1832–83). An epoch-making French painter, the pioneer of Impressionist painting (q.v.). He was born at Paris, Jan. 23, 1832, and belonged to a family of magistrates, who desired him to follow the same career. After completing his studies at the Collège Rollin, at Paris, he was sent to Rio de Janeiro in the hope of changing his determination to become a painter. Persisting in his design, upon his return to Paris in 1850 he entered the studio of Couture, with whom he worked five years. He then traveled in Germany, Holland, and Italy, studying the old masters, especially the works of Tintoretto at Venice, whose influence is evident in a series of religious pictures painted about this time. But a more important influence upon his work was that of the Spanish painters, particularly of Velazquez, whom he afterward studied in the Prado. He eventually evolved a style of his own, which broke absolutely with tradition and revolutionized modern painting. One chief characteristic of this style is the substitution of actual values of color (q.v.), as they are in nature, for the relative or corresponding values of the studio. Another was a broad execution, in which he gave the predominating local color, ignoring the minor variations, thus giving the general effect, to the effacement of detail and modeling. The tendency of his painting was constantly towards lighter color, and he finally adopted the plein-air technique, particularly from about 1870; thereafter most of the products of his brush were open-air subjects.

Among the best known of his early works are: "The Artist's Parents" (1860); "Boy with a Sword" (1860, Metropolitan Museum, New York); "Guitar Player" (1860, Osborn collection, New York); "Dead Toreador" (Widener collection, Philadelphia); "Music in the Tuileries" (1862, Dublin Gallery); "Execution of Emperor Maximilian" (1868–69, Mannheim Gallery); "The Balcony" (1869, Luxembourg). His "Breakfast on the Grass," in which a nude female figure is contrasted with clothed men, raised a storm of misdirected indignation. His other works include: a "Dead Christ and Angels" (1864, Havemeyer collection, New York); "Olympia" (1865); the "Garden" (1870, Havemeyer, New York), his first real plein-air painting; "The Good Beer" (1873, Arnold collection, Berlin); "The Opera Ball" (1873, Havemeyer, New York); "Argenteuil" (1874, Tournai Museum); the "Railroad" (1874); "The Laundry" (1875); "Nana" (1876); "Bar at Folies-Bergère" (1882); "Jeanne" (1882). Among his many portraits were those of Théodore Duret (1867, Petit Palais); Emile Zola (1868); the painters Eva Gonzalez (1870) and Berthe Morisot (1872, Dublin); "The Artist" (1875); Clémenceau (1879); Henri Rochefort (1881, Hamburg); Antonin Proust (1881); besides several of himself and his wife. He painted also, especially in the sixties, admirable still-life subjects, a number of which are in the possession of the Durand-Ruel Company, in New York and Paris. He also executed a number of pastels, and etched a series of his works (published 1874), besides illustrating Cros's *Le fleuve*, Champfleury's *Les chats*, and Poe's *Raven*.

Painting of so revolutionary a character raised much criticism, in which Manet's part was ably taken by his friend Zola. His choice of subjects from low life also militated against his popularity. The Salon was usually closed against him and he was forced to hold separate exhibitions. He did not receive the Legion of Honor till 1882, and not until after his death was his importance fully realized. He was a highly cultured man, of great wit and social charm. His death occurred at Paris, April 30, 1883.

Bibliography. The first and one of the best critical accounts of Manet's life and works is by his friend Théodore Duret, *Histoire d'Edouard Manet et de son œuvre* (Paris, 1902). Like that by another friend, Antonin Proust (ib., 1913), it is full of personal reminiscences. Soundly critical German monographs were written by Hugo von Tschudi (Berlin, 1902) and Meier-Graefe (Munich, 1912). Of great interest is Emile Zola, *Edouard Manet: Etude biographique et critique* (Paris, 1867). Other accounts are: Edmond Bazire (Paris, 1884); Gonse, *Gazette des Beaux-Arts*, vol. i (ib., 1884); Beckwith, in J. C. Van Dyke, *Modern French Masters* (New York, 1896); Etienne Moreau-Nelaton, *Manet, graveur et lithographe* (Paris, 1906); Laran and Le Bas, *Edouard Manet* (Philadelphia, 1912), containing a bibliography; Théodore Duret, *Manet and the French Impressionists*, translated by J. E. C. Flitch (London, 1912).

MANETENERI, mä′nå-tå-nā′rē. A tribe of Arawakan stock (q.v.) residing upon the Upper Purus and Juruá, southern affluents of the Amazon, on the Brazil-Bolivia frontier. They are a river people, constantly on the move in great canoes of cedar wood. They weave cotton cloth and use iron axes and fishhooks.

MAN′ETHO (Lat., from Gk. Μανεθών, *Manethōn*). The most important of all classical writers who have treated the history of ancient Egypt. He is said to have been a native of Sebennytus in the Delta, a high priest (of Heliopolis or Sebennytus), and scribe of the temples of Egypt; i.e., a president or secretary of the priestly assemblies. He appears as representative of the Egyptian priesthood and Egyptian learning under Ptolemy I Soter when he and the Athenian priest Timotheus were the only scholars able to identify as Serapis the statue of an unknown god brought from Sinope to Alexandria. It is certain that Manetho's principal work, the *Egyptian History*, was written, however, under Ptolemy II Philadelphus, as it contains a reference to the Arsinoite nome (i.e., the Fayum), and must therefore be later than 273 B.C., the date of the marriage of Ptolemy II with his sister Arsinoë. This history, in three books, has become famous, for it was the only work in Greek based on a full knowledge of the Egyptian sources. A more doubtful tradition states that Ptolemy II himself selected Manetho as the Egyptian scholar who possessed the most profound Greek scholarship and ordered him to write the history of the country. Manetho undoubtedly possessed as much knowledge of Egyptian history as could be expected of any Egyptian priest, and he followed chiefly the native sources, inserting occasional polemics against the errors of Herodotus and others. Nevertheless, his work is marred by the introduction of some mythological Greek names and other matters.

Manetho's work, now known only through a few bits of narrative in Josephus (*Against Apion*) and from tables of dynasties and kings in the Christian chronographers, does not seem to have been much read outside of Egypt, though it played an important part in the controversy between Josephus and Apion near the end of the first century A.D. Later the Christian chronographers made considerable use of it in arranging the biblical chronology, but it is questionable if they had the complete work. Thus, we have only a few passages of the history quoted in Josephus, and the chronological tables, e.g., in Julius Africanus and Eusebius, both tables preserved only in the work of George Syncellus of Byzantium (792 A.D.), and in the so-called *Excerpta Barbari* (in Latin). These extracts have come down to us in such a mutilated form that it is very difficult to form an opinion of the value of the original book. The earlier Egyptologists overrated the importance of this authority, and lately it has been treated with the greatest skepticism. Not only have the names and dates been corrupted to a large extent, but Manetho undoubtedly did not possess sufficient sources of information to make his book absolutely reliable. Nevertheless, we still retain his division of Egyptian history into 30 dynasties from Menes (before whom the fabulous reigns of gods, demigods, and manes are enumerated) to Alexander, although this division is recognized to be merely conventional in more than one case. The old discussion as to whether the dynasties of Manetho were all consecutive or whether some were contemporaneous has been settled in favor of the second theory, although it applies only to a few cases (e.g., dynasties 15 to 17). The Sothiac cycle of 1460 years (at the end of which the short civil year of the Egyptians and the correct astronomical or Julian calendar again coincided), followed by Manetho in his chronological arrangement, has been of little use to modern scholars, owing to the fragmentary condition of the extracts. It is often possible to correct the errors of Manetho by the aid of the monuments. Consult: Boekh, *Manetho* (Berlin, 1845); Unger, *Chronologie des Manetho* (ib., 1867); handy editions of the text in Bunsen, *Egypt's Place in Universal History*, translation, vol. i (London, 1848–67), and in C. Müller (ed.), *Historici Græci Minores* (2 vols., Leipzig, 1870–71). Manetho is said to have written also: *A Compendium of Natural Science; Concerning Feasts; On the Preparation of Kyphi* (i.e., aromatic frankincense). Whether these works were spurious, as is undoubtedly the *Apotelesmata*, an astronomical work of the Christian time, cannot be determined; another "Manethonian" book, the *Sothis* (i.e., dog star), is clearly spurious, as it is dedicated to the Emperor Augustus.

MANETTI, mȧ-nĕt'tē, GIANOZZO (1396–1459). An Italian humanist, born at Florence. He was educated for commercial affairs, but from 1421 identified himself with the literary life of the time, studying Greek and acquiring a knowledge of Hebrew then unusual. He served as Ambassador to the courts of Venice, Naples, Rome, and other Italian governments. His fame as an orator was great and many marvelous stories of his eloquence are preserved. The greater number of his discourses were pronounced in Italian, but were translated into Latin for publication. He became so influential that Cosimo de' Medici by oppressive taxes drove him from Florence. He was then attached to the service of Pope Nicolas V, and later of King Alfonso of Naples. His learning was extensive, and in his endeavors to effect harmony between Christian traditions and the rediscovered classical world he became one of the foremost exponents of the new learning. He lacked literary art, however, and his works are often verbose and platitudinous. Among his writings are translations into Latin of the ethical treatises of Aristotle, the Psalms, and the New Testament, and a lengthy polemic, *Contra Judæos et Gentes.* Consult Vespasiano da Bisticci, *Commentario della vita di Giannozzo Manetti*, edited by Frati (Bologna, 1893).

MAN'FRED (c.1232–66). King of Naples and Sicily from 1258 to 1266. He was a natural son of the Emperor Frederick II. On his father's death, in 1250, he received the Principality of Tarentum, and in the absence of his half brother, Conrad IV, acted as regent in Italy. After Conrad's death he was acknowledged regent of Apulia for his nephew Conradin (q.v.). Pope Alexander IV caused a crusade to be preached against him, but Manfred, steadily pursuing his victorious career, became, in 1257, master of the whole Kingdom of Naples and Sicily. On the rumor of Conradin's death he was crowned King of Palermo, Aug. 10, 1258, and immediately afterward was excommunicated by the Pope, together with his adherents, among whom were the first prelates of the Kingdom. Manfred invaded the papal dominions, levied heavy contributions from them, and made himself master of the whole of Tuscany. His power now seemed secure, especially as he married his daughter Constance to Peter of Aragon, while he himself married the sister of the Greek Emperor Theophilus. His government was at once mild and vigorous; he founded many schools, built towns and harbors, and labored in many ways for the improvement of his Kingdom. But this tranquillity was not of long duration. Pope Urban IV renewed the excommunication against him and his friends, and bestowed his dominions as a papal fief on Charles of Anjou, the brother of Louis IX of France. Manfred, though at first successful in the war which ensued, was at last defeated and slain in a bloody battle at Benevento, Feb. 26, 1266. His widow and children were savagely treated by the French, the daughter being imprisoned for 17 years and the sons dying in captivity. His body, as that of an excommunicated person, was interred on the battlefield under a heap of stones. Consult: Schirrmacher, *Geschichte der letzten Hohenstaufen*, vol. iv (5th ed., Leipzig, 1878); A. Karst, *Geschichte Manfreds vom Tode Friedrichs II. bis zu seiner Krönung* (Berlin, 1897); Karl Hampe, *Urban IV. und Manfred* (Heidelberg, 1905); Jordan, *Les origines de la domination angevine en Italie* (Paris, 1909). See CHARLES OF ANJOU.

MANFRED. A dramatic poem by Byron (1817). Count Manfred, a kind of magician, dwelt in the Alps in solitary misery. Superhuman in his nature, he was so in his suffering. Schumann composed a musical setting of the poem, which was performed under Liszt's direction at Weimar in 1852. A version of *Manfred* was produced upon the stage in England in 1863.

MAN'FREDO'NIA, *It. pron.* män'frȧ-dō'nē-ȧ. A town in the Province of Foggia, Italy, 23 miles northeast of the city of Foggia, on the Gulf of Manfredonia (Map: Italy, E 4). It is strongly walled, and an imposing castle protects its port, which is accessible only to small vessels. Two miles west of the town are the ruins of ancient Sipontum, of which the cathedral of Santa Maria Maggiore, a twelfth-century edifice in the Romanesque style, has been partly restored. In the vicinity of Manfredonia are some remarkable salt lakes; figs, almonds, and carobs are extensively exported. It is the seat of an archbishop. The town was founded by Manfred in 1263, but its industrial growth was checked by the Turks, who pillaged it in 1620. Pop. (commune), 1901, 12,188; 1911, 13,692.

MANGABEY, măn'gȧ-bĭ (a geographical name in Madagascar, erroneously applied by Buffon to an animal which is not found in the island). Any one of a group of eight or nine species of West African monkeys forming the genus *Cercocebus*, which is related to the guenons on one side and to the macaques on the other. They are distinguished by peculiarities of dentition, by the backward direction of the hairs of the crown, and strikingly by having white eyelids, wherefore they are frequently called white-eyelid monkeys. One well-known species, common in zoölogical gardens (where it is hardy and develops many amusing and gentle traits), is the sooty mangabey (*Cercocebus fuliginosus*, or *æthiops*). It is sooty black in color and has the singular habit of carrying its tail always thrown forward over its back. See Plate of MONKEYS OF THE OLD WORLD.

MANGALDÁN, män′gȧl-dän′. A town of Luzon, Philippines, Province of Pangasinán, situated near the south shore of the Gulf of Lingayén, 13 miles east-northeast of Lingayén (Map: Luzon, C 2). It is connected with Dagupán by highroad and a branch of the Manila-Dagupán Railroad. Pop., 1903, 15,841.

MANGALORE, măŋ′gȧ-lōr′, or **MANGALUR**, măŋ′gȧ-lo͞or′. The capital of the District of South Canara, Madras, British India, 407 miles south-southeast of Bombay, on the Arabian Sea (Map: India, C 7). The residential section of the city is pleasantly situated on several hills which afford an extensive view of the sea and the thickly forested surrounding region. It has a German mission where instruction is given in the different crafts, and is the seat of a government college and the Jesuit College of St. Aloysius, both of which are connected with Madras University. The town has a large Roman Catholic population, mainly Goanese, and is the seat of a bishop. A large trade is carried on in coffee, nuts, and pepper, and various grades of cloth are manufactured. The harbor is a backwater formed by the junction of two small streams and affords good anchorage. The port has an annual trade to the value of 65 lacs of rupees, mainly in coffee. Mangalore is renowned for the brave resistance its little garrison offered the army of Tippu Sahib in 1782–83. Pop., 1891, 40,922; 1901, 44,108; 1911, 48,412.

MANGAN, JAMES (1803–49). An Irish poet, born in Dublin and educated in schools of that city, at one of which a learned priest helped him to varied linguistic acquirements. For literary purposes he added Clarence to his given name. During 10 years, beginning in his fifteenth year, he served in a scrivener's office and for three years in an attorney's office. Thereafter he was employed for short periods in the Ordnance Survey Office and in Trinity College Library. For the rest he lived an erratic and precarious literary life, depending upon his pen for support, and sinking deeper and deeper with the years into indulgence in drugs and alcohol. He and Ferguson after him were the originators of a new Celtic movement. His poetry is exceedingly uneven: at his best—in 20 or 30 of his famous poems—he is second to none of the Irish poets who have written in English; in the large remainder of his work he is little more than a skillful versifier, and at times aridly rhetorical. The best of his poems—the splendid "Dark Rosaleen" among them—are based upon Gaelic originals or drawn from Gaelic sources. While he lived only one collection of his poems, *Anthologia Germanica* (1845), appeared. All his best work is found in: *Poems* (1859); *Essays in Prose and Verse* (1884); *Selections* (ed., Miss L. I. Guiney, 1897). Consult D. J. O'Donoghue, *Life and Writings* (London, 1897).

MANGANBLENDE, măŋ′gan-blĕnd. See ALABANDITE.

MAN′GANESE (Neo-Lat. *manganesium*, an arbitrary variant of *magnesium*, magnesium). A metallic element first isolated by Gahn in 1774. It is generally accepted that Pliny was acquainted with pyrolusite, or manganese dioxide, and assuming it to be a variety of magnetic iron ore, which was called *lapis magnesius*, he called the manganese compound *magnesia*. Basil Valentine and later chemists regarded the compound as an ore of iron, and mentioned its use in glassmaking under the name of *lapis manganensis*. That the compound really contains no iron was first shown by Pott in 1740, and later researches by Scheele and Bergman established the fact of its being a distinct chemical species. The name *magnesium*, at first applied to its isolated metal, was changed to *manganese* by Buttmann in 1808.

Manganese ores are found in many parts of the world. The occurrences of the United States may be grouped as follows: 1. Manganese ores, containing at least 35 per cent manganese. They are found most abundantly in the Appalachian and Piedmont regions of Virginia and Georgia, in the southern Mississippi valley, and on the Pacific coast. One of the largest mines, situated near Crimora, Augusta Co., Va., has been operated for nearly 50 years and is still productive. The ore occurs in pockets in a thick bed of residual clay, and is mined by the hydraulic process. 2. Manganiferous-iron ores, containing usually more than 5 per cent manganese and a variable proportion of iron. These are found chiefly in New England, the Appalachian region, and the Lake Superior iron district. 3. Manganiferous-silver ores, consisting of mixtures of manganese and iron oxides and hydroxides, with small amounts of lead and silver. While they occur both in the Rocky Mountain and Great Basin regions, Leadville, Colo., is the most important locality. 4. Manganese-zinc residuum, an artificial furnace product with manganese and iron, obtained from the zinc volatilization of New Jersey zinc ores. The production of spiegeleisen and ferromanganese in the United States in 1913 was 226,475 long tons. The imports were 128,147 long tons. Enormous deposits of manganese ore are found in southern Russia and in the State of Minas Geraes, Brazil. Small quantities of manganese are also present in certain mineral waters, in many plants, especially the cereals and vegetables used as human food, and it is a constituent of the sun's atmosphere. The metal itself is readily obtained by reducing the oxide with carbon or by heating manganese chloride with metallic sodium. Manganese (symbol, Mn; atomic weight, 54.93) is a very hard, grayish-white metal with a reddish lustre. It takes a high polish and is not malleable. Its specific gravity varies between 7.13 and 8. Its melting point is about 1897° C. (about 3447° F.). The metal itself has no uses, but forms valuable alloys with copper, iron, zinc, tin, aluminium, lead, magnesium, etc. Those with iron, containing from 8 to 20 per cent of manganese, are used in the manufacture of steel under the names of *spiegeleisen*, while those with 20 to 80 and even 90 per cent manganese are called *ferromanganese*. The presence of manganese in iron and steel is said greatly to increase their elasticity and hardness, and even

1 per cent of manganese will render cast steel more tenacious. Copper-manganese alloys are used in the manufacture of manganese bronze, manganese brass, and manganese German silver. Heusler's alloy is a peculiar magnetic alloy of copper, manganese, and aluminium.

With oxygen manganese forms several oxides, including a monoxide (MnO), a sesquioxide (Mn_2O_3), a dioxide (MnO_2), a trioxide (MnO_3), and a heptoxide (Mn_2O_7). Besides these a number of intermediate oxides are believed to exist. The most important of the oxides is the *dioxide*, or peroxide, which occurs native as *pyrolusite* and is the black manganese of commerce. The *sesquioxide* of manganese, or manganic oxide, occurs in nature as the mineral braunite, or, in a hydrated form ($Mn_2H_2O_4$), as the mineral manganite. The *monoxide* of manganese, or manganous oxide, occurs in nature as the mineral manganosite, or, in a hydrated form (MnH_2O_2), as the mineral pyrochroite. It is the manganese salts corresponding to this oxide that are found, always together with iron salts, in mineral water and in the organisms of animals and plants. For the *trioxide* of manganese, see MANGANIC AND PERMANGANIC ACIDS.

In the formation of manganous and manganic salts the manganese acting as a metal unites with the halogens, with sulphur, selenium, nitrogen, phosphorus, arsenic, antimony, vanadium, boron, carbon, silicon, titanium, tin, and zircon. Manganese may also form double salts with the principal metals, and compounds of manganese with organic acids, as acetates, are known.

Uses. The greater part of manganese ore mined is used in the iron and steel industries. The ore used for alloys should have at least 40 per cent manganese and under .2 per cent phosphorus, but silica and other impurities can be eliminated in the smelting. If manganese is used as an oxidizer, the ore should contain a high percentage of manganese dioxide. Much is consumed for this purpose in the flint-glass industry, and the ore which has at least 80 per cent MnO_2 and under 1 per cent iron comes chiefly from the southern Caucasus Mountains, Russia, and Thuringia, Germany. For dry batteries high-grade pyrolusite with over 85 per cent MnO_2 is employed. The more siliceous and argillaceous types of manganese ore are employed for coloring pottery, tiles, and bricks. Some manganese ore is also employed as a flux in smelting lead-silver ores, especially when the ore itself contains some of the precious metals. The use of manganese is no longer important in the manufacture of chlorine or oxygen. Consult: L. L. Fermor, "Manganese Deposits in India," in *Geological Survey of India, Memoirs*, vol. xxxvii (Calcutta, 1909); E. C. Harder, "Manganese Deposits of the United States, with Sections on Foreign Deposits, Chemistry, and Uses," in *United States Geological Survey, Bulletin 427* (Washington, 1910); Roscoe and Schorlemmer, *Treatise on Chemistry* (5th ed., London, 1913); Talbot and Brown, *Bibliography of the Analytical Chemistry of Manganese* (Washington, 1913).

MANGAN′IC AND PER′MANGAN′IC ACIDS, H_2MnO_4 and $HMnO_4$, respectively. Two important acid compounds of manganese. The former is unknown in the free state, but is well known in the form of certain of its salts, termed *manganates*. The most important of these are the manganates of potassium (K_2MnO_4) and barium ($BaMnO_4$). Potassium manganate is obtained by fusing manganese dioxide with caustic potash and potassium chlorate or nitrate; on cooling the mass is dissolved in a moderate quantity of water and the solution is allowed to evaporate *in vacuo*. The salt thus obtained is unstable, being readily decomposed by acids, or even by an excess of water, into potassium permanganate (see further below), caustic potash, and manganese dioxide. It is this reaction that causes the well-known change of color in solutions of potassium manganate. The manganate of barium is obtained by heating barium oxide with manganese dioxide; it may be used as a green pigment. *Manganic anhydride*, or manganese trioxide (MnO_3), may be obtained by dissolving potassium permanganate in strong sulphuric acid and heating the solution.

Permanganic acid may be obtained in the uncombined state by the action of sulphuric acid on barium permanganate; but the resulting solution decomposes with extreme readiness and hence the acid cannot be isolated from it. The solution is deep red in color and has powerful oxidizing and bleaching properties. The most important among the *permanganates*, or salts of permanganic acid, is the permanganate of potassium ($KMnO_4$), which forms long prismatic crystals having a deep red color by transmitted light and a green metallic lustre. It may be prepared by heating one of the oxides of manganese with an alkali and potassium chlorate or some other oxidizing agent, and heating the resulting mass with water, when manganese dioxide is precipitated and potassium permanganate remains in solution. A method of preparation often employed consists in adding potassium chlorate to a solution of caustic potash, adding finely powdered mineral manganese dioxide to the solution, evaporating to dryness, heating the residue to a semiliquid condition, allowing to cool, dissolving the resulting mass in hot water, and passing into the solution a current of carbonic acid gas, until the transformation appears to be complete. The solution is then filtered through guncotton, concentrated by evaporation, and allowed to crystallize. Another method much used consists in preparing potassium manganate (see above) and exposing it to the action of acids. In the solid state, as well as in concentrated solutions, potassium permanganate is very readily decomposed. Mixed with sulphur and phosphorus, solid potassium permanganate can be ignited by striking. Mixed with charcoal, it can be ignited by moderate heating. Its saturated solution (one part in 15 parts of water at ordinary temperature) decomposes on the application of gentle heat and even on standing for some time at ordinary temperatures. Even in dilute solution potassium permanganate acts as a powerful oxidizing agent, and upon this are based many of its uses in medicine, analytical chemistry, and the arts. Sugar and many other organic substances are readily oxidized by it. Potassium iodide (in solution) is converted by it into potassium iodate. If a solution of potassium permanganate is mixed with one of peroxide of hydrogen (another oxidizing agent), the two substances give up part of their oxygen simultaneously, so that both are reduced at the same time. The oxidizing power of potassium permanganate is considerably increased in the presence of acids. Among the uses of the permanganate may be mentioned its use for the preparation of oxygen, its use as a bleaching agent, its use in the purification of water, ammonia, and carbonic acid gas, its use in photography, and finally its use as a disinfectant, deodorant, and antiseptic in medicine. It is employed as a deodorant for bedpans and as a wash for the hands, the solution commonly used being known as Condy's red fluid. In a very dilute form it may be used as a mouth wash or gargle and as an injection in cases of gonorrhœal and other morbid discharges. According to some authors, if given internally in the form of pills, potassium permanganate has an action much like that of the salts of iron. The *permanganate of sodium* is very similar to that of potassium and is prepared by an analogous method. In the arts sodium permanganate is often employed in place of the potassium salt, but the latter alone is employed in chemical analysis. *Permanganic anhydride*, or manganese heptoxide, Mn_2O_7, is extremely unstable.

MAN′GANITE (from *mangan-ese*, from Neo-Lat. *manganesium*, arbitrarily altered from *magnesium*). A hydrated manganese peroxide that crystallizes in the orthorhombic system. It is most frequently found in prismatic crystals, deeply grooved and grouped in bundles or sheaves. Manganite has a submetallic lustre and is dark steel gray to iron black in color. It usually occurs in veins associated with calcite and barite in the older rocks. Manganite is found in the Harz, Thuringia, Sweden, Norway, England, and in the United States at various localities in Michigan and Colorado. In common with other manganese minerals it is used in the manufacture of alloys, as spiegeleisen and ferromanganese, and as a coloring material in calico printing and dyeing, for coloring glass and pottery, and in the manufacture of paints.

MANGATAREN, mȧn′gȧ-tä′rĕn. A town of Luzon, Philippines, in the Province of Pangasinán. It is situated on the Agno River road, 18 miles south of Lingayén, on a tributary of the Agno Grande. Pop., 1903, 12,895.

MANGBATTU. See Monbúttu.

MANGE (OF. *mangeue*, *mangue*, *manjue*, *menjue*, itch, voracity, food, from Lat. *manducare*, to chew, devour). A disease of horses, dogs, and cattle, similar to scab in sheep and itch or acariasis in the human subject, resulting from one or more of four different kinds of minute mites which attack the skin, causing much irritation, heat, and itching and the eruption of minute pimples, with dryness, scurfiness, baldness, and bleaching of the skin. The treatment consists in destroying the mites and insuring the cleanliness and health of the skin, both of which objects are effected by washing the parts thoroughly every second day with soft soap and water and dressing daily with sulphur or mild mercurial ointments or with a solution containing four grains either of corrosive sublimate or arsenic to the ounce of water. Castor-oil seeds, bruised and steeped for 12 hours in buttermilk, are very successfully used by the native Indian farriers. Where the heat and itching are great, as is often the case in dogs, a few drops of tincture of belladonna may be added to the usual dressing, or applied with a little glycerin. Where the general health is indifferent, as in chronic cases, the patient should be liberally fed, kept clean and comfortable, have an occasional alterative dose of any simple saline medicine, such as nitre or common salt, and a course of such tonics as iron or arsenic. Cleanliness and occasional washing and brushing maintain the skin in a healthy state and thus prevent its becoming a suitable place for the mites. The most suitable and convenient method for treating the mange of cattle is to build large dipping vats and plunge the affected cattle into a dip containing lime and sulphur or tobacco and sulphur.

MANGEL-WURZEL, măṉ′g'l-wûr′z'l (Ger., beetroot), Mangel, Mangold, or Field Beet. A general name for the varieties of the common beet (*Beta vulgaris*), extensively grown in temperate climates, especially in Europe, for the feeding of cattle, sheep, and swine. Formerly only garden varieties of the beet were grown, but during the last century larger, coarser varieties suitable for feeding came into prominence. The different varieties of field beets are generally divided into four groups: first, according to their shape, which is either long or more or less globular; and second, their exterior color, red or yellow. The long red and long yellow varieties produce the heaviest yields, but are usually coarse and fibrous and of low feeding value as compared with other varieties. A number of varieties of this group with twisted roots are known as the oxhorn varieties; the intermediate forms, also known as gatepost varieties, have large oval roots with red, yellow, or orange skins. The tankard varieties, which are of uniform width except at the abruptly tapering extremities, are shorter than either the long or the intermediate varieties. The mangel-wurzel is best adapted to deep clayey loam soils, moist but well drained, well tilled, and rich in plant food. In countries where this root has a place in the rotation of crops a heavy dressing of barnyard manure is incorporated in the soil before planting the seed, which is done in early spring. Six or eight pounds of seed are used to the acre in drills about 2 feet apart, the distance between the plants in a row being about 1 foot. To insure quick and equal germination, the seed is often steeped in warm water before planting. Close planting gives smaller and relatively more nutritious roots. During the growing season the crop is hoed by means of the cultivator or the hand hoe to keep the surface loose and free from weeds. Since the roots are injured by frost, the harvesting should be done before freezing occurs, the roots being dug by hand or lifted with an implement designed for the purpose; and if properly harvested without bruising, which induces decay, and well stored in a cool cellar or in pits, they will keep till late in the spring. The yield usually ranges from 18 to 25 tons per acre. Mangel-wurzel have on an average the following percentage composition: water, 91.2; protein, 1.4; fat, 0.2; nitrogen-free extract, 5.4; crude fibre, 0.8; and ash, 1.0. Like most roots, they are very succulent. The food

MANGEL-WURZEL.

value is chiefly dependent upon the starch and other carbohydrates making up the nitrogen-free extract. Roots of all kinds are much more commonly fed in Europe than in the United States. In Great Britain they replace much of the forage and grain in the ration of stock, as much as 20 pounds being fed daily to sheep and 100 pounds to cattle. Mangel-wurzel are chiefly used in the United States to give variety to the ration and are fed in smaller quantities. They are most often fed to dairy cows, 20 to 30 pounds being a fair daily allowance. They are sometimes fed to sheep, and boiled and mixed with meal they furnish good feed for pigs. Like other roots, they should be sliced for sheep, and sliced or pulped for cattle. Some feeders believe that they are valuable not because they themselves induce greater gains, but because they stimulate the appetite for other feeds and tend to keep the animal in good physical condition.

MAN′GIN, Edward (1772–1852). A British writer, born in London. He attended Balliol College, Oxford, where he graduated B.A. in 1793 and M.A. in 1795. Entering the Irish church, he held prebendal stalls in Killaloe Cathedral and in St. Patrick's, Dublin, but, being provided with a comfortable income, he passed most of his time at Bath, where he became known as a conversationalist and writer, and where he died. Among his publications are: *The Deserted City, or Bath in Summer* (1805), a parody on Goldsmith's *Deserted Village; An Essay on Light Reading* (1808); *Utopia Found: An Apology for Irish Absentees* (1813); *An Intercepted Epistle from a Person in Bath to his Friend in London* (three editions, 1815); *Piozziana: Recollections of Mrs. Piozzi* (1833).

MANGIN, General Joseph. See Supplement.

MANGKASSARS. See Macassars.

MANGLE (Dutch *mangel;* connected with Ger. *Mange*, mangle, Icel. *mangi*, mangonel, from ML. *manganum*, from Gk. *μάγγανον, manganon*, instrument for throwing stones). A machine for smoothing linen and cotton goods, such as tablecloths, sheets, etc., after washing, by passing between rollers. See Laundry Machinery.

MANGO, măŋ′gô (from Malay *mañggā*, Tamil *mānk*, mango fruit), *Mangifera*. A genus of about 25 species of evergreen trees of the family Anacardiaceæ, natives of India and the Malay Peninsula. The common mango (*Mangifera indica*) is a spreading tree of rapid growth, which attains a height of 40 feet or more, but whose undivided trunk is rarely more than 10 feet long. The foliage is very dense, forming a welcome shade. Its leaves are entire, lanceolate, shining, 6 to 8 inches long. The flowers are rather small, reddish white or yellow, borne in dense panicles. The fruit is more or less kidney-shaped, smooth, varying in size and color with different varieties, and contains a large flattened stone nearly as long as the fruit. The shell of the seed is rough and fibrous; in some of the poorer varieties the fibres are very abundant and apparently make up a considerable portion of the fruit. In the choicer kinds the pulp is more solid and rather free of fibres. This tree exists in nature in India, where it extends up the Himalayas to elevations of 3500 feet or more. It has been extensively introduced into other regions, so that now it is cultivated in nearly all tropical and subtropical countries. In India there are said to be more than 150 cultivated varieties, the fruit of some weighing a pound or more. All parts of the tree have a turpentine fragrance, and in some varieties the flavor of turpentine in the fruit is very pronounced. Others are without it and are highly prized for desserts, being luscious, sweet, or with a slight acidity. The unripe fruits are used for pickles, sauces, etc., and the kernels are often roasted and eaten. They are nutritious and in times of scarcity are used as food by the poorer classes of India. The mango was introduced into Jamaica in 1782, and much attention is given its cultivation in that country. Its cultivation has been extended throughout the West Indies and to some extent in southern Florida and California. Eight-year-old trees in Florida have borne as many as 5000 fruits in a season. The trees are propagated either from seed or by inarching of choice varieties upon vigorous seedling stock. Of the other species *Mangifera fœtida*, called the horse mango, is a large tree native of Malacca and vicinity. The fruit, which has a peculiar characteristic odor and flavor, is highly esteemed by the natives, and is cultivated throughout India. *Mangifera oppositifolia*, by some botanists called *Boula burmanica*, is a wide-spreading lofty tree which grows wild in Burma. It bears an edible yellow fruit about the size of a large plum. There are numerous varieties, some of which are sweet, others sour. *Mangifera sylvatica* also bears an edible fruit esteemed by the natives in India. It is often dried and kept for medicinal purposes. The wood of the different species is gray, rather soft, and used for planking, doors, window frames, packing cases, canoes, and boats.

MANGO (*Mangifera indica*).

MANGO BIRD. A bird frequenting mango trees: (1) in Jamaica, a humming bird (*Lampornis mango*); (2) in India, an oriole (*Oriolus kundoo*).

MANGO FISH (so called because it makes its appearance in April, about the same time as the mangoes). A small perchlike fish (*Polynemus plebijus*) which abounds along the shores of southeastern Asia, and in India enters bays and river mouths at the season when the mango fruits grow ripe. It represents a distinct but small group of tropical fishes (Rhegnopteri), of which several species are known under the family name threadfins, or Polynemidæ. The most prominent among many distinguishing characters of the group is the fact that the actinosts of the pectoral fins are of three forms—two of them normal, supporting the pectoral fin; one longitudinal, without rays; and the fourth a plate on the coracoid supporting free and separate rays, three to 10 in number, according to the species. These free rays are filaments trailing from the throat, sometimes longer than the body, each under muscular control; and they serve as feelers, for these fishes not only creep about in muddy estuaries, but are nearly blind, owing to the normal growth of films over the eyes. Several species occur in tropical American waters. One (*Polydactylus virginicus*), the barbu or barbudo (q.v.) of West Indian fishermen, is an important food fish in Cuba, and was called mango fish in the old books. Consult A. C. L. G. Gunther, *Introduction to the Study of Fishes* (Edinburgh, 1880), and P. H. Kirsch, *Annals of the New York Academy of Sciences*, vol. v (New York, 1890).

MANGO GINGER. A tropical plant. See CURCUMA.

MANGOLD. See MANGEL-WURZEL.

MANGOLDT, män′gôlt, HANS KARL EMIL VON (1824–68). A German economist, born in Dresden. He studied law and political science at Leipzig, Geneva, and Tübingen, and in 1848 was appointed to prepare a history of the industries of Saxony, but was prevented by changes in the administration from carrying out the work. In 1852 he became editor of the Weimar *Gazette*, and in 1855 he published his *Lehre vom Unternehmergewinn*, in which he was the first to analyze fully the phenomena of business profits. In 1858 he became extraordinary professor of political economy at Göttingen and in 1862 was called to the chair of political and cameral science at the University of Freiburg. In 1863 he published his *Grundriss der Volkswirthschaftslehre*, a treatise of admirable clearness which ranks among the first German contributions to the theory of economics.

MAN′GON, or **MAN′GONEL.** A mediæval implement of warfare, similar to the ballista, used for throwing stones and other missiles. See ARTILLERY.

MANGONI, mȧn-gô′nė, or **ANGONI.** Zulu intruders into the Nyassa region, British South Central Africa. They number about 230,000 and are descendants of a Zulu tribe which migrated from Zululand and crossed the Zambezi about 1825, founding a kingdom southeast of Lake Tanganyika. Thence they migrated west of Lake Nyassa, where they established three separate kingdoms. These military migrations are characteristic of the Zulus, who have been the cause of far-reaching ethnic displacements in Africa. In their movements they eliminated the men, and by marriages with the women of the conquered tribes, themselves became greatly modified, especially in language. The aristocracy of the Mangoni perpetuate the Zulu customs, while their language is that of their mothers. Thus, they wear the apron of cat-tails and, when engaged in war, kilts of skin around the waist or over the left shoulder and a headdress of raven and cock feathers, and carry clubs and stabbing assegais, the shafts of the latter being ornamented with goatskin. The oval shield of antelope or cow skin, like that of the Zulu and Matabeles, is also carried. They wear a profusion of personal ornaments, strips of hide with long hair secured around the leg and upper arm, armlets of elephant toe nails and ivory, and charms in shells, antelope horns, or beaded leather cases. The Zulu head ring of plaited hair and wax is sometimes seen, and the ears are bored to hold blocks of polished wood or ivory. The Mangoni are fine specimens of men and carry themselves well. The chief owns the herds of cattle, while the flocks of sheep and goats belong to individuals. Their villages are large and are composed of circular wattle and daub houses surrounded by compounds fenced in with reeds. Their vegetable food consists of maize, sorghum, cassava, rice, millet, sweet potatoes, beans, and peas. Cotton, oil seeds, and tobacco are also raised. The rule of the chief is supreme, but there is a numerous body of *idunas* or councilors, whose advice is sought. These councilors are assigned to various districts, for which they are responsible to the chief. The clan system prevails. The religion of the Mangoni is the worship of ancestors, and in the cult ceremonies and offerings are made to appease them. Several grades of witch doctors are possessed of priestly authority; the chief is high priest by virtue of his office. Consult Robert Codington, in the *Geographical Journal* (London, 1898), and Sir H. H. Johnston, *British Central Africa* (ib., 1906).

MANGOON, MANGUN, mȧn-gōōn′. See OLCHAS.

MAN′GOSTEEN (Fr. *mangostan* [the tree], *mangonste* [the fruit], from Malay *mangonsta, mangis*, the native name), *Garcinia mangostana*. One of the most delicious of all fruits, produced by a slow-growing tree of the family Guttiferæ, a native of the Molucca Islands. The tree, which rarely exceeds 20 feet in height, has an erect tapering stem and a regular form. The leaves are 7 or 8 inches long, oval, entire, leathery, and shining; the flowers large, with corolla of four deep-red petals. The fruit, which is orange-like, dark reddish brown, spotted with yellow or gray, has a thick rind and like the orange is divided internally by thin partitions into segments. The pulp is soft and juicy, cooling, with a mixture of sweetness and acidity, and delicately flavored. The mangosteen is cultivated in Java and in the southeast of Asia, and has been successfully introduced into some other tropical countries.

MAN′GROVE (from Malay *mañggi-mañggi*, mangrove; influenced by popular etymology with *mango* and *grove*, in allusion to its spreading by the formation of new stems), *Rhizophora.* A genus of plants of the family Rhizophoraceæ, which consists of a few species of trees and shrubs, all tropical and natives of coasts, particularly about the mouths of rivers, where they grow in the mud and form a close thicket down to and within the sea, even to low-water mark. The coast and keys of southern Florida abound in mangroves. Most of the species send down roots from their branches, and thus rapidly extend over large spaces. The clublike seeds have the peculiarity of germinating while still attached to the parent branch, a long thick radicle proceeding from the seed and extending rapidly downward till the fruit falls off and is quickly embedded in the mud. The bark of the common or red mangrove is used in tanning. The red-flowered mangrove, *Lumnitzera*, of the family Combretaceæ, is often associated with the true mangroves. The tree is being planted along the embankments of the railroad that traverses the Florida Keys to protect them from storms. The wood is heavy, fine-grained, and strong, and is employed in boatbuilding, etc. See Plate of Magnolia and Mangrove.

MANGROVE (*Rhizophora mangle*).

MANGROVE HEN. In Jamaica, the long-billed rail (*Rallus longirostris*), of which the North American clapper rails are varieties. See Rail.

MANGROVE SNAPPER. A fish, the gray snapper (q.v.), so called in Florida and the Bahamas because the young abound in the protection of the mangrove trees which everywhere border the seacoast.

MANGROVE SWAMP. A plant formation common on seacoasts and tidal river shores in tropical and subtropical climates. The dominant vegetation consists of mangrove trees interspersed with plants of similar habit. The accumulation of débris and mud among the roots and trunks builds up the land so that bays are filled and river banks extended until the streams are restricted to narrow channels between dense walls of trees which completely conceal the shores.

MANGUIAN, mȧn′gē-än′, or **MANGYAN.** All the wild natives of Mindoro are known as Manguian. In reality they do not form a single tribe or stock. Those in the north and about Mount Halcon closely resemble the Negrito, both in physical type and culture, while in the vicinity of Bulalakao and southern Mindoro they are typical Malays, somewhat advanced towards civilization. The women of this latter group wear cloth skirts and sometimes upper garments of cloth, and some men are seen with shirts. Lances and iron knives are used to a considerable extent. The southern Manguian write their language with an alphabet, evidently of Indian origin, cutting the characters into the smooth outer surface of bamboo joints. See Philippine Islands.

MANGU KHAN, män′gōō kän. See Mongol Dynasties.

MAN′GUM. A city and the county seat of Greer Co., Okla., about 150 miles by rail west-southwest of Oklahoma City, on the Chicago, Rock Island, and Pacific and the Wichita Falls and Northwestern railroads (Map: Oklahoma, B 4). It is in a rich farming country, producing wheat, cotton, corn, and kaffirs, and has an oil mill and a flour mill. Mangum has adopted the commission form of government. Pop., 1900, 2672; 1910, 3667.

MANGUM, Willie Person (1792–1861). An American politician, born in Orange Co., N. C. He graduated from the University of North Carolina in 1815 and was admitted to the bar in 1817. In 1818–19 he served in the General Assembly and was elected by that body judge of the Supreme Court in 1819, but resigned the next year. He served as a member of the United States House of Representatives from 1823 to 1826, when he again became judge. He was a presidential elector in 1829 and in 1831 became a member of the United States Senate. At the request of the Legislature he resigned in 1836, and the next year he received the 11 electoral votes of South Carolina for President. In 1840 he was returned to the United States Senate in place of Bedford Brown, who had also been requested by the Legislature to resign, and served until 1853, when the Whig party was practically disintegrated in his State. In 1842 he was elected president of the Senate to succeed Samuel L. Southard, of New Jersey, and served until 1845. During his senatorial service he was one of the leaders of the Whig party.

MANGUN, mȧn-gōōn′. See Olchas.

MANGWANGA, mȧn-gwäng′gȧ. See Mandaya.

MANHAT′TAN. A city and county seat of Riley Co., Kans., 51 miles west of Topeka, on the Kansas River, at the mouth of the Big Blue, and on the Union Pacific and the Chicago, Rock Island, and Pacific railroads (Map: Kansas, F 4). The State Agricultural College, opened in 1863, is situated here, and the city contains also the Sacred Heart Academy, Carnegie library and fine courthouse, high school, and Federal buildings. Manhattan is the commercial centre for a farming, fruit, and stock-raising district, and has white limestone quarries, a foundry, flour mills, ice plant, and agricultural machine works. The water works are owned and operated by the municipality. Manhattan has adopted the commission form of government. Pop., 1900, 3438; 1910, 5722.

MANHATTAN COLLEGE. A Roman Catholic institution in New York City, under the control of the Brothers of the Christian Schools. It was opened in 1849 as an academy for young men under the name of the Academy of the Holy Name, and was incorporated under its present name in 1863. It has an arts and a science department, conferring the degrees of B.A. and B.S. Besides the college proper there are academic and commercial departments. A course in civil engineering, leading to the C.E. degree, is also offered. In 1913–14 the registration was 270 and the faculty numbered 28. The college library contained 23,300 volumes. The president in 1914 was Rev. Brother Edward, F.S.C.

MANHATTAN INDIANS (native name = the island of hills). An Indian tribe of the Wappinger confederacy which at the time of discovery occupied Manhattan Island and portions of both the Bronx and Long Island. Consult E. M. Ruttenber, *Indian Tribes of the Hudson River* (New York, 1872), and Alanson Skinner, "Manhattan Indians," in *New York State Museum, Bulletin 158* (Albany, 1912). See MAHICAN.

MANHATTAN ISLAND. An island at the head of New York Bay, forming the borough of Manhattan in New York City and containing the commercial and financial nucleus of the metropolis, together with its main residence portion (Map: New York City, Greater New York, E 5). It lies between the Hudson River and the East River; Spuyten Duyvil Creek and the Harlem River separate it from the mainland on the north and northeast. The island, with tapering north and south extremities, a few hundred yards wide, is 13½ miles long, with a maximum width, at Fourteenth Street, of 2¼ miles, and an area of 22 square miles. It has a wharfage front of 22 miles, with a depth of water sufficient for the largest vessels. The Brooklyn Bridge, the Manhattan Bridge, the Williamsburg Bridge, and the Queensboro Bridge connect it with Long Island, and several bridges span the Harlem River and Spuyten Duyvil Creek; numerous ferries and tunnels communicate with the adjacent shores. The surface is undulating and rocky, in the north rising from the Hudson to an altitude of 238 feet at Washington Heights, but sloping abruptly towards the east, where is a level stretch formerly known as the Harlem Flats. Farther south the elevation continues as a central ridge, with a gentle slope on either side. Extensive leveling was necessary in laying out the streets. With the exception of the Harlem plain and an extensive bed of beach sand to the south and east of City Hall, the island is chiefly composed of crystalline Archean rocks with intercalated veins of gneiss, mica schist, and hornblende, overlaid by generally shallow glacial drift deposits. The greater part of the city is built on the rock foundation; pile foundations, however, are resorted to in the deeper glacial deposits and in the beach sand. Peter Minuit, the first Dutch Governor-General, is said to have received Manhattan Island in 1626 for barter to the value of about $25. See NEW YORK CITY.

MANI, mä′nē, also called MANES and MANICHÆUS (c.216–277). A Persian sage, founder of a religious and philosophical system which spread widely and lived long, especially in its western forms. The most valuable accounts of Mani's life are found in Mohammedan histories. He was born near Ctesiphon in Mesopotamia, where he received his education. His father, Fatak, was connected with the Mughtasilah, a South Babylonian sect of "baptizers," akin to the Mandæans (q.v.) and perhaps also to the Elkesaites (q.v.). Towards his thirtieth year Mani began the new religious movement which was to bear his name, preaching at the court of the Persian King, Shapur I. He claimed that he received divine revelations, and that he was the final prophet of God to the world. Not meeting with great success at court, he undertook a series of missionary journeys, penetrating into Turkestan, India, and China. He also sent out disciples to preach his doctrines. After spending many years in missionary labor, Mani returned to Persia, where he now won converts even at the royal court. But the Magians (the Persian priesthood) rose in opposition, and he was imprisoned, but managed to escape. After the death of Shapur Mani returned to the capital and was received with favor by the new King, Hormuz I. But the Magians renewed their attacks, and after some years of conflict secured his condemnation during the reign of Bahram I. Mani was crucified and his body was flayed and exposed to public contempt. His followers suffered bitter persecution.

Mani is reported to have been a man of great and varied ability along several lines, e.g., in the art of painting. He wrote in the Syriac and Persian languages, but used an alphabet of his own invention, which continued in use among his followers. His works, which were known to the Mohammedan historians, but have since been mostly lost, included the *Book of Secrets*, describing certain Christian sects of the East; the *Book of Precepts for Hearers*, the most widely current of his writings, probably to be identified with what Augustine calls the *Epistola Fundamenti;* and a *Holy Gospel* (perhaps not its actual title, though it is so called), a work written in Persian while Mani was in retirement in Turkestan. He also wrote several shorter treatises and numerous letters.

Bibliography. Among the most important sources for Mani's life are the Arabic *Fihrist* by Abulfarag an Nadim (tenth century), edited by Flügel (Leipzig, 1871–72); the Greek *Acta Disputationis Archelai*, edited by Routh, in *Reliquiæ Sacræ*, vol. v (Oxford, 1848), translated into English in the *Ante-Nicene Fathers*, American edition, vol. vi; and Eusebius, *Ecclesiastical History*, vii, 31. In Latin, the works of Augustine are valuable for western Manichæism; consult the *Nicene and Post-Nicene Fathers*, first series, vol. iv (edited by P. Schaff). For fragments of Manichæan works recently discovered, consult Kugener and Cumont, *Recherches sur la Manichéisme*, ii (Brussels, 1908), and "Un traité manichéen retrouvé en Chine," translated by Chavannes and Pelliot, in *Journal Asiatique*, series 10, vol. xviii; series 11, vol. i (Paris, 1911–13). In general, consult De Beausobre, *Histoire critique du Manichéisme* (Amsterdam, 1734); St. Augustine, *Writings in Connection with the Manichæan Heresy*, translated by Richard Stothert (Edinburgh, 1872); Konrad Kessler, *Manichäische Religion: Forschungen über die Mani* (Berlin, 1889); P. E. More, "Influence of Hindu Thought on Manichæism," in *American Oriental Society, Journal* (New Haven, 1896); Rochat, *Essai sur Mani et sa doctrine* (Geneva, 1897); Kessler, *Mani* (Berlin, 1899); Adolf Harnack, *History of Dogma*, vol. iii (Boston, 1903). For Mani's doctrine, see MANICHÆISM.

MA′NIA (Lat., madness). A form of insanity characterized by exaltation of emotional state, motor excitement, flight of ideas, great self-esteem, irritability, and impulsive reactions. See MANIC-DEPRESSIVE INSANITY.

MANIA, INDUCED. See IMITATIVE INSANITY.

MANICALAND, mȧ-nē′kȧ-lănd. Formerly a tributary state of Gazaland, and now divided between Portuguese East Africa (q.v.) and Rhodesia, forming in the latter part of the Province of Mashonaland (q.v.). It is very valuable for its gold fields and is traversed by the railway line from Beira to Fort Salisbury.

MANIC-DEPRESSIVE INSANITY. This is a form of mental derangement which usually occurs in one of two phases, to which respectively were given the terms "mania" and "melancholia." *Mania* of the older psychiatry comprises the excited and exalted cases, characterized by flushed face, flight of ideas, exaggerated well-being or irritability, impulsiveness, motor excitement, and emotional extravagance. Generally pleasurable and expansive ideas fill the mind. The patient imagines he is a person of great importance, wealthy, powerful, possibly a king or a queen. Distractibility is a prominent feature, and the flow of incessant language usually includes the expression of some ideas taken from the environment or descends into a tendency to senseless rhyming, the shifting and uncontrolled attention being easily influenced by surrounding people or chance conversation. The patient is oriented in many cases, occasionally somewhat clouded through failure of attention, and judgment is always disordered. Besides the euphoria (happy and elated condition) there is marked irritability. There is some eroticism in most cases and the moral sense is always diminished, the patient frequently indulging in alcoholic or other excesses, when previously of exemplary habits. The ordinary form of the manic type has been described. A milder form is that of *hypomania*, which is characterized by full orientation, absence of all delusion, excessive energy and constant overactivity, exalted good humor, great self-esteem, boisterous manner and language, and possibly irritability and outbreaks of anger.

The depressed type of manic-depressive insanity is characterized by a painful emotional state, despondency, weakening of the power of attention, sluggishness of the association of ideas, incomplete perception, constant indecision, and uncertainty. The patient may be conscious of his changed condition and of his weakened will. He may meditate suicide, under the delusion that he has committed some grievous sin or has some incurable disease. Hallucinations and delusions may be present. The condition described is the former *melancholia*, now understood to be a phase of the manic-depressive state. Physical symptoms are abundant, for the patient suffers from coated tongue, offensive breath, constipation, loss of appetite, sluggish surface circulation, small, slow pulse, loss of weight, and loss of sleep. In some cases there is a condition of stupor, into which the patient drifts, and during which all conscious and voluntary intellectual activity is suppressed, or the patient may be completely absorbed in frightful delusions and hallucinations. The stupor is an episode and does not represent a separate phase of the malady. Mixed states occur, such as *agitated depression*, *maniacal stupor*, and *unproductive mania*, which is characterized by exaltation and increased psycho-motor activity with difficult thinking (White). *Recurrent mania*, *recurrent melancholia*, and *periodic mania* belong under the head of manic-depressive insanity, as do *alternating insanity* and *circular insanity* (cyclothymia). In the last the patient experiences a brief depressed state followed by a maniacal outburst, which in turn is followed by depression, the cycle continuing without intervals. Involutional melancholia does not belong in this category. (See MELANCHOLIA.) Attacks of manic-depressive insanity last from a few days to many months. While the prognosis is bad for ultimate perfect recovery, the patient as a rule recovers from the separate attacks.

The treatment includes very little use of drugs. Hydrotherapy usually renders either drug or mechanical restraint unnecessary in the manic cases. The excited cases are to be guarded against exhaustion and well fed. Depressed cases must be under the eye constantly; sufficient food must be given (sometimes by means of the stomach tube), sufficient sleep must be secured, and the eliminative functions must be kept active. There is a tendency towards recovery, without intellectual enfeeblement, and a tendency towards recurrence. Over 60 per cent recover. This form of insanity constitutes about 12 per cent of all new admissions to hospitals for the insane, the manic cases predominating. See INSANITY.

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